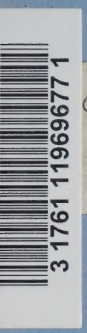

A REPORT BY THE SECTOR TASK FORCE ON

THE CANADIAN AEROSPACE INDUSTRY

Chairman D. C. Lowe

REPORT
OF
THE AEROSPACE MANUFACTURING SECTOR
CONSULTATIVE TASK FORCE

June 30, 1978.

REPORT OF
THE AEROSPACE MANUFACTURING SECTOR CONSULTATIVE TASK FORCE

CONTENTS

REPORT OF THE AEROSPACE MANUFACTURING SECTOR CONSULTATIVE TASK FORCE

EXECUTIVE SUMMARY

Introduction

The Task Force had top level representation from the industry, organized labour, provincial governments and the academic community. The federal government provided resource and secretariat assistance.

Canada's aerospace industry has earned an international reputation through its high success in export markets. It has the capability to develop and manufacture specialized aircraft, engines, space equipment and related sub-systems; perform high quality sub-contract manufacture for domestic and foreign primes; and provide life cycle support services in the civil and defence areas.*

It is clearly not practical for Canada to become self-sufficient in the design and manufacture of all its aerospace equipment needs. Canada must, therefore, foster an economically sound aerospace industry which is capable of serving the domestic market on a selective basis and also achieve a relatively high level of export business. A reliance on export business exposes the industry to international competitive factors, and productivity improvement by a constant upgrading of the sector's technology is essential. The costs of maintaining an adequate level of competitive technology both in the innovation and production areas are very high for this advanced technology sector.

It is a world characteristic of the aerospace industry that governments must contribute to innovation and modernization costs. Canada's aerospace competitors receive a high proportion of the costs of updating technology through defence spending. Foreign competing industries, rather than the Canadian industry, have tended to receive the direct benefit of major Canadian defence procurements. The Task Force gave a great deal of attention to this characteristic and has recommended ways whereby the Canadian industry can receive important benefits from Canadian defence spending which it is not now receiving, without in any way recommending that the total level of such spending should be increased.

The sector is in a growth cycle. The challenge for the future is for the industry and governments to act together, with the participation of organized labour, to maintain and stabilize the growth pattern in the long term: the Task Force report offers a charter and related actions to achieve this goal.

Strategic Objectives

As a first step, the Task Force developed and endorsed a framework of strategic objectives for industrial and trade development and the sector, summarized as follows:

- to develop and sustain select industrial capabilities in research, design, development, and production of products with good prospects for exploitation in domestic and export markets;
- to provide the industrial support to meet selected needs of national defence;
- to provide an internationally competitive sub-contracting base;
- to provide an internationally competitive in-plant repair and overhaul activity;
- to achieve a satisfactory and economically viable regional distribution of industrial activity.

Significant Issues

Work Groups, which examined the implications of implementing the strategic objectives, identified the following significant issues. A detailed discussion of these issues is included in the report and constituted the basis for the majority of the Task Force recommendations:

- Lack of Stimulus to the Aerospace Sector from Canadian Defence Spending
- Lack of Availability of Skilled Manpower
- Increasing Restrictions to Technology Transfer
- Problem of financing High Cost, High Risk Canadian Aerospace Products

* the industry's capability in avionic systems was discussed by related Electrical and Electronics Sector Task Forces.

- Problem of Maintaining Adequate Modernization Investment

- Need to Facilitate Domestic and Export Civil Products

- Need to Enhance Industrial Benefit from Federal Government Procurement

- Productivity and Competitiveness

- Regional Development

- Need for Continuing Consultation between Parties on the Task Force

Recommendations

The Task Force made the following recommendations, that:

- The federal government recognize that the Aerospace Manufacturing Industry is well established as a high technology sector with excellent prospects for economic growth and accept the framework of strategic objectives as a charter for its continued support of an integrated aerospace industry in Canada.

- The process of consultation between all parties in the Task Force be continued and enhanced and an implementation program outlined with detailed objectives and target dates.

- The federal government should establish a policy for the Department of Defence to earmark a fixed portion of its budget to be spent in Canadian industry for advanced technology equipment and research and development so as to provide a reasonable stimulus to its technology similar to that enjoyed by our NATO partners.

- The future human resource needs of the industry be audited and urgent steps taken to ensure that they can be primarily sourced in Canada.

- Restrictions which have developed to technology transfer, primarily with the U.S., should be eliminated by negotiating a return to the spirit of free exchange of technology in international co-operative agreements and an enhanced development of technology in Canadian industry, as a basis for sharing knowledge.

- The federal government financial support of Canadian specialized aircraft, engines, systems and sustaining research and development be maintained.

- The modernization of the industry's production capability should be increased, with government support.

- There should be a negotiated liberalization and expansion of trade in civil aerospace products and services.

- Government procurement should be used as a tool to support the industry and to assist in demonstrating its products to world markets.

- Regional dispersion of existing companies in the Montreal, Toronto and Winnipeg centres should not be encouraged, instead consideration should be given to finding new work which can be performed by upgraded small companies in other regions.

- The industry's productivity improvement programs be continued in the longer term to assure its international competitiveness.

REPORT OF THE AEROSPACE MANUFACTURING SECTOR CONSULTATIVE TASK FORCE

INTRODUCTION

Background

The Aerospace Manufacturing Sector Consultative Task Force, under an industry chairman, had top level representation from 15 companies, from the two leading unions, from five provincial governments and from a leading university. The federal government provided resource and secretariat assistance.

The Task Force was one of 22 task forces established as a result of the first Minister's Conference in February 1978. The Task Force was invited to examine the Aerospace Manufacturing Sector and form specific recommendations to governments on action they should take to stimulate economic activity. A component of the Task Force study was to state whether or not the Sector Profile issued in January 1978 was a satisfactory information base.

Characteristics of the Industry Sector

The Task Force considers that the Sector Profile attached to this report is a satisfactory statement of the characteristics of the sector.

Canada's aerospace industry has earned an international reputation through its high success in export markets. It has the capability to develop and manufacture specialized aircraft, engines, space equipment and related sub-systems; perform high quality sub-contract manufacture for domestic and foreign primes; and provide life cycle support services in the civil and defence areas.

The Task Force is confident that the present growth pattern of the industry's output and employment has a sound basis in terms of world market growth and the industry's capabilities. The challenge is to maintain stable growth in the longer term.

It is clearly not practical for Canada to become self-sufficient in the design and manufacture of all its aerospace equipment needs. Canada must, therefore, foster an economically sound aerospace industry which is capable of serving the domestic market on a selective basis and also achieve a relatively high level of export business. A reliance on export business exposes the industry to international competitive factors and productivity improvement by a constant upgrading of the sector's technology is essential. The costs of maintaining an adequate level of competitive technology both in the innovation and production areas are very high for this advanced technology sector.

It is a world characteristic of the aerospace industry that governments must contribute to innovation and modernization costs. Canada's aerospace competitors receive a high proportion of the costs of updating technology through defence spending. Foreign competing industries, rather than the Canadian industry, have tended to receive the direct benefit of major Canadian defence procurements. The Task Force gave a great deal of attention to this characteristic and has recommended ways whereby the Canadian industry can receive important benefits from Canadian defence spending, which it is not now receiving, without in any way recommending that the total level of such spending should be increased.

A FRAMEWORK OF STRATEGIC OBJECTIVES

The Task Force has identified significant issues which should receive attention by industry and government in the context of securing long-term, stable, growth of the Aerospace Manufacturing Sector. As a starting point the Task Force developed and endorsed a framework of strategic objectives which define the span and position of the sector in relation to domestic and world market needs and its role in supporting national defence:

Objective 1 - To further develop and/or sustain selected capabilities in research, design, development and production of commercial aircraft, aeroengines, space equipment, avionics* and their related sub-systems and components which offer good prospects for exploitation in domestic and international markets.

Objective 2 - To further develop and/or sustain the technological capabilities of the Aerospace Industry Sector in selected areas to meet and anticipate national defence needs and to assist the sector to be competitive on defence export projects.

Objective 3 - To further develop and/or sustain a strong, internationally competitive sub-contracting base for sub-systems components and sub-assemblies used in aircraft, aeroengines, avionics* and space applications.

Objective 4 - To further develop and/or sustain a competitive in-plant repair and overhaul capability for aircraft, aeroengines, avionics* and space equipment and their related sub-systems and components.

Objective 5 - To achieve a satisfactory and economically viable regional distribution of industrial activity.

* The members agreed at the first meeting that "Avionics" activities would be considered by the Electrical and Electronics Consultative Task Forces.

In recognition of the excellent growth potential for the sector, the Task Force recommends that the framework of strategic objectives, together with the implied commitment of long-term financial and other essential support, be accepted by the federal government as a charter for its continued support of an integrated aerospace industry in Canada.

The parties to the Task Force are ready to continue working with the federal government to develop co-operative plans and actions within the framework of strategic objectives which can secure stable growth in the long term. By these means, the Task Force considers that the economic performance of the sector will be enhanced so as to increase its already significant contribution to the economic well-being and sovereignty of Canada.

SIGNIFICANT ISSUES

Many issues, both general and specific, were identified by the Task Force through working groups which addressed the implications of each strategic objective. The working papers developed for each objective have been deposited with Industry, Trade and Commerce (DITC).

To avoid duplication, and in the interests of limiting the length of this report, both general and specific actions recommended by the Task Force have been placed in the context of the following range of significant issues. The issues are to a great extent interdependent:

- Lack of Stimulus to the Aerospace Sector from Canadian Defence Spending
- Lack of Availability of Skilled Manpower
- Increasing Restrictions to Technology Transfer
- Problem of Financing High Cost, High Risk Canadian Aerospace Products
- Problem of Maintaining Adequate Modernization Investment
- Need to Facilitate Domestic and Export Sales in Civil Products
- Need to Enhance Industrial Benefit from Federal Government Procurement
- Productivity and Competitiveness
- Regional Development
- Need for Continuing Consultation between Parties on the Task Force

LACK OF STIMULUS FROM DEFENCE SPENDING

Discussion

Without an adequate level of direct procurement of research and development (R & D) and products and services by Canadian defence sources, the Canadian industry is denied an essential stimulus to its technological development. The competing industries in other NATO countries are given such stimulus in high measure by deliberate government policies to foster their defence industry base for economic and sovereignty reasons. By contrast, in recent years,

Canada has purchased its major defence equipment abroad and in respect of the Aurora Long Range Patrol Aircraft Program there are indications that much support of the aircraft and its systems over the operational life (life cycle support) may be sourced in the U.S.

The federal government policy is to provide financial assistance to the Canadian industry for R & D, modernization and to establish Canadian industrial sources, through a Defence Industry Productivity Program (DIP). This facilitates the participation of the industry in U.S. defence programs under a Canada/U.S. Defence Production Sharing Agreement (DPSA). Although such participation is an essential part of the industry's export success, the overall effect of DIP support has not compensated for the lack of stimulus which would be accorded by a greater share of direct Canadian defence spending in Canadian industry. Particular areas which could benefit by selective direct defence procurement are foundation technology in evolutionary innovative areas, weapon systems integration and life cycle support.

Detailed Recommendations

The Task Force recommends the following actions, but stresses that an increase in the total defence spending is not intended; merely to provide the industry with more direct participation in defence procurements in the interests of national economic growth and maximum sovereignty over the use of Canadian defence materiel:

The federal government should institute a policy of spending a fixed minimum portion of its defence capital budget for direct procurement of Canadian designed and manufactured advanced technology products, by:

- Increasing the minimum of such procurement to at least one quarter of the total capital budget over a ten-year period.

- Providing Canadian industry with better guidance on the nature and size of anticipated long-term defence procurements so that the selection and preparation for Canadian involvement can be made in a planned basis.

- Reducing any hazard to the DPSA, inter alia, by specially selecting work for sourcing in Canadian industry which can meet special Canadian sovereignty needs, (e.g. provision of special Canadian operational systems).

The federal government should provide Canadian industry with funds and/or tax incentives and the opportunity to more directly perform R & D in support of future Canadian defence needs, by:

- Selecting the R & D projects on the basis of future Canadian defence equipment requirements and related potential export markets.

- Where possible, co-ordinating the defence sponsored procurement with projects supported by DITC for export markets.

- By spending a meaningful fixed portion of its total budget on R & D in Canadian industry.

The federal government and industry should take special measures to develop a comprehensive operational support and maintenance engineering competence in Canadian industry, by:

- The federal government contracting a maximum amount of defence life cycle support in Canadian industry and in particular by maximizing the Canadian industry life cycle support on the Aurora and the New Fighter Aircraft programs.

- The Department of National Defence (DND) defining and arranging Canadian based life cycle support capabilities at the start of its procurement cycle for new equipment and the government being ready to pay the front end costs to establish the Canadian sources.

- Creation by industry of special consortia arrangements, where necessary, to render life cycle support in a cost effective manner (e.g. to avoid uneconomic duplication in the purchase and use of integrated test equipment and to interface with foreign primes for the purpose of assuring engineering cognizance).

The federal government should seek special industrial benefits as offsets to the major defence equipment procurements which must be met from abroad. The industrial benefits should, where possible, be of a long-term advanced technology nature. Further, the federal government should provide assistance through DIP, or by special arrangements, towards premium start-up costs to capture industrial benefits for Canadian industry as offsets, where the work is clearly identified in the national interest and where the opportunity might otherwise be missed.

LACK OF AVAILABILITY OF SKILLED MANPOWER

Members of the Task Force identified shortages of trade and engineering skills in the aerospace manufacturing sector. In some trades, such as skilled machinists, the shortages are acute. The shortages have developed due to the loss of skilled personnel during the decline of work in the early 1970's, many of whom had found more secure employment in other sectors and chosen not to return to aerospace work. The educational institutions and industry did not appear to be sufficiently co-ordinated in the approaches to training new entrants. In the past, shortcomings in the supply of trained resources from Canadian sources have been often overcome by immigration. A lack of apprenticeship training in the industry was noted and the failure to establish apprenticeships to national standards was a matter of concern to all parties.

The Task Force considered that in principle the industry should be able to source its human resource requirements in Canada. The steady growth in the sector now occurring and expected to continue should provide stability of employment. The most urgent steps are now necessary between industry, organized labour, federal and provincial governments and educational establishments to identify the short-term and future human resource needs; and to take appropriate steps to train, recruit and develop a stable work force.

Detailed Recommendations

The detailed recommendations of the Task Force for this issue are:

Industry should maintain an inventory of its short-term and future human resource needs with a view to identifying the complete actions to be taken in concert by provincial and federal governments, industry, organized labour and educational establishments to ensure that the industry's human resource needs can be met primarily from Canadian sources. (This matter is already receiving attention in the Montreal and Toronto areas as an activity of the Air Industry of Canada (AIAC) Productivity Program and in the Winnipeg area by the industry, with provincial government participation).

Industry and government should increase training in industry and in vocational educational establishments, including an increase in apprenticeship training to national standards.

INCREASING RESTRICTIONS TO TECHNOLOGY TRANSFER

Discussion

The Sector Profile described the international nature of aerospace manufacturing and air operations. There is a large measure of interdependence between the Canadian and U.S. industries, with the latter dominating the scene due to the world dominance of the U.S. industry in both technology and output. The Canadian industry is very capable in developing and applying product and manufacturing technology in specialist areas but it cannot be self-sufficient in all areas of interest. The industry, like its foreign counterparts, relies on an international technology exchange.

The main vehicles for technology exchange have been through government to government agreements, in particular the DPSA; through foreign parent/Canadian subsidiary arrangements; and through informal industrial connections. Recently, disquieting indications of

intentions to raise impediments to technology transfer from the U.S. to Canada have been stated in a report to the U.S. Congress and in statements by labour and government officials in seminars. Such restrictions would be against the spirit of the DPSA and could be very harmful to the Canadian industry participation in U.S. defence work within that agreement. On the other hand, Canada cannot expect an open membership in the international technology transfer club if it should fail to bring to partnerships a sufficient level of Canadian generated technology. The level of Canadian spending on R & D is, in fact, low in relation to other countries with aerospace industries and an increase of activity is essential in the view of the Task Force, preferably in specialist areas of long-term evolutionary value.

Detailed Recommendations

The Task Force recommends the following actions:

The federal government should seek a renegotiation of the DPSA to remove impediments to technology transfer which have developed in recent years and which are against the spirit of the original understandings.

Industry and government should act together to maintain an adequate Canadian technology base which can sustain international technology exchange arrangements, particularly in specialized areas of a long-term evolutionary nature where Canada can expect marketing success.

The federal government and/or industry should stand ready to enter into co-operative research and development arrangements between foreign governments and companies where this is in the mutual economic interests of the partners.

FINANCING OF HIGH COST/HIGH RISK CANADIAN AEROSPACE PROGRAMS

Discussion

Aerospace industries throughout the world are recognized as requiring government financial support. The need for support is very pronounced for developing and launching of major aircraft and engine programs which are of a high cost and high risk nature. The nature of the support ranges from guarantees provided by the federal government to commercial lenders to direct grants and loans through federal programs to stimulate industrial development.

Like most industry sectors when an inflationary, economically uncertain environment persists, the opportunities for equity financing are limited. Debt financing is the rule but commercial lending without government guarantees is either unobtainable or is at a very high interest cost. Commercial lending is simply not attuned to the provision of long-term, risk capital which is needed to finance major aerospace programs either in Canada or elsewhere.

As already noted, the Canadian industry does not receive the benefit of lead financing from major procurements of defence equipment which in other countries is often the foundation for commercial programs. It is hoped that in the long term the actions for greater defence procurement in Canadian industry can be a foundation for the industry involvement in both defence and commercial programs. In the short to medium term, the continuation of special government support for major Canadian aerospace programs is vital. In the longer term, the example of the Canadair Challenger aircraft program, which is now wholly financed from commercial sources on the basis of its initial market success, gives hope that a greater degree of commercial lending will be available if the industry's growth is maintained and stabilized by the total measures now recommended by the Task Force.

Detailed Recommendations

The detailed recommendations of the Task Force for this issue are:

The federal government and industry must finance high cost/high risk aerospace programs to at least current levels, by a long-term commitment of federal government support (e.g. through DIP and EDP) to maintain Canadian integrated design, development, manufacturing and marketing capabilities in key evolutionary programs.

Industry and government should seek to improve attitudes and arrangements relative to the readiness of Canadian financial institutions to provide both short and long-term funds to this industry sector, e.g. The Export Development Corporation to liberalize funding for exports of aerospace products to third world markets.

Industry and governments should optimize the benefits from the application of available funds, by:

- Better co-ordination of financial support measures provided by different departments and agencies of the federal government and where applicable with provincial governments.

- Where appropriate, seeking a sharing of costs through arranging joint ventures between Canadian companies/or between Canadian companies and companies abroad.

PROBLEM OF MAINTAINING ADEQUATE MODERNIZATION INVESTMENT

Discussion

The Sector Profile provides evidence that the industry has failed to maintain an adequate level of investment in recent years sufficient to replace or modernize its production equipment. The aerospace industry is characterized by a constant change of its design and production technology due to pressures to meet exacting performance standards for its products and to contain costs to an acceptable level.

Many changes render existing equipment obsolete, for example, the changes in manufacturing methods implicit in the increasing adoption of titanium alloys, high strength steels and high modulus composite material systems. In addition, each new product or process requires specific tooling.

The Canadian industry is of relatively small scale compared to the main competitor and partner, the U.S. industry. The U.S. companies tend to have a more assured domestic business base. These factors increase the problem for Canadian industry to find sufficient investment funds for its production equipment, and for start-up costs, to be at least as productive and competitive with the U.S. industry. It is the view of the Task Force that the federal government financial assistance programs, such as DIP, Industry Modernization for Defence Establishments (DIP IMDE) and DIP Source Establishment, must be continued and, if possible, increased in the short term to take advantage of increasing market opportunities, some of which are associated with Aurora and NFA offset arrangements.

Detailed Recommendation

Accordingly, the Task Force recommends that the federal government give consideration to increasing the allocation of funds for industry modernization assistance and, exceptionally, to extend DIP/IMDE to routine equipment where more advanced equipment is inappropriate.

NEED TO FACILITATE DOMESTIC AND EXPORT SALES OF CIVIL PRODUCTS

Discussion

The Canadian industry is highly export market oriented with between 70 to 80 per cent of its output serving foreign markets. The trend in the past decade has been to an increasing share of exports being in civil products or services so that currently civil exports are double those which are defence related. Although it is hoped that the dollar level of defence exports will increase under the impetus of the Aurora and NFA offset programs, the success of the Challenger, Pratt and Whitney jet engines and commercial airline components in civil markets will probably maintain a leading export share for civil products and services. A complementary expansion of domestic civil (and defence) sales is highly desirable to provide a satisfactory mix of domestic and export business and visibility of domestic support for Canadian products and services to foreign buyers.

The Canadian industry would welcome a liberalization of civil exports to the U.S., similar to that enjoyed for defence products under the DPSA, as an outcome of the current Multilateral Trade Negotiations (MTN). The industry sector has recommended through the

Air Industries Association of Canada (AIAC) that Canada negotiate with the U.S. an elimination of the 5 per cent U.S. import duty and be prepared to eliminate permanently Canadian import duties, which are effectively waived on an annual basis.

Greater liberalization of trade through tariff reductions will not in itself enable the Canadian industry to participate in major foreign aircraft and engine programs. Competitiveness is, of course, essential but to an increasing extent the Canadian company must assume a part of the development and production start-up costs to be amortized as the complete products are sold. The entry of Canadian industry to significant foreign programs may require a specially arranged consortium approach with government organizational and marketing assistance, and financial support by government to reduce the entry costs risks may be essential.

Detailed Recommendations

The detailed recommendations of the Task Force for this issue are:

The federal government should review and reduce restrictions to the export of Canadian aerospace products and services, by:

- Seeking to eliminate through MTN foreign tariffs on aerospace products and services (particularly the U.S. 5 per cent import duty) and, as a quid pro quo to permanently eliminate the Canadian import duties which are effectively waived on an annual basis.

- Minimizing the impact of regulatory and export licensing policies on industry and trade development.

Industry and government should identify evolutionary growth areas for Canadian industry in relation to world aerospace markets, by:

- Conducting and co-ordinating joint industry/government development of marketing strategies which can maximize the comparative advantage of Canadian industry in selected specialist areas.

- Maintaining a continuing industry/government intelligence base of market opportunities, trends and capabilities by area and sub-sector (including a continuation of the special statistical collection and analysis service provided by DITC for AIAC member companies).

Industry and government should give a high priority to facilitating the industry participation in major new civil international aerospace programs by:

- Tailoring and where necessary, establishing industry/government mechanisms to secure Canadian industry participation in civil international aerospace programs, (e.g. industry to generate special consortia arrangements, in partnership with government where necessary), but avoiding a proliferation of marketing assistance agencies.

- Government to be responsive in a timely fashion to assist industry in reducing the financial risk of entry to major international aerospace programs where this is identified to be in the long-term national economic interest.

The federal government should seek to encourage economic domestic purchases of civil aerospace products having a high ratio of Canadian content, for example, by ensuring that the data on potential economic benefit to Canada is fully known by prospective purchasers.

Federal government should implement mechanisms for financing the Canadian sourced portions of products from abroad to Canadian air operators on terms equally favourable to those applicable to financing from foreign sources for foreign sourced products.

NEED TO ENHANCE INDUSTRIAL BENEFIT FROM FEDERAL GOVERNMENT PROCUREMENT

Discussion

To improve and stabilize its business base, the Canadian industry should, whenever possible, be used to satisfy government aerospace needs. Whereas it is clearly not economic for Canada to become self-sufficient in the design and manufacture of all its aerospace needs, the Task Force considers that in both the defence and civil areas the industry could be a larger economic supplier to government if given sufficient early warning of requirements and a fair opportunity to compete for the work.

The industry considers that the federal government may not be paying a fair price for the products and services it provides which is commensurate with the cost and risk environment for the sector. The need to improve payment terms for product support, for example, is recommended to government. The government should also pursue its policy of buying R & D services and repair and overhaul services in industry vigorously and consider locating new research and test facilities in industry, for general use on a rental basis.

The Task Force endorses the desirability of government providing lead purchases of Canadian-designed products, again on an economic basis, as a shop window for foreign sales. Moreover, it considered that government could improve its attitudes and behaviour, in the interests of industrial development in Canada, when formulating its regulatory, licensing and taxation policies.

Detailed Recommendations

The recommendations of the Task Force for this issue are complementary to the issue of government procurement of defence materiel already discussed, and are:

The federal government should promote the sale of Canadian products to domestic government users plus domestic air operators so as to provide a shop window for sales abroad, i.e. to seek a closer co-ordination of policies between domestic procurement of aerospace products and international trade development.

The federal government should improve the financial terms of government procurement contracts to be commensurate with the risks and cost of providing aerospace related services to government.

The federal government should continue its policy of buying its aerospace related research and development services and repair and overhaul services in Canadian industry to the greatest extent practicable. Consideration should be given to locating centralized test and research services in industry for general rental where possible.

PRODUCTIVITY AND COMPETITIVENESS

Discussion

The industry sector has instituted a wide ranging program of productivity improvement with the aim of maintaining its international competitiveness. The program named Productivity Aerospace is managed by the AIAC and comprises seminars and action groups designed to maintain and improve productivity in the areas of human resources, management systems, manufacturing methods, marketing and the industry/government interfaces. Since the inception of the program in September 1977, the larger companies have held 12 seminars and extended an open invitation to all other companies to attend. Open follow-up consultation is a feature. The result is an interaction of people at all levels from both large and small companies and an increasing sharing of knowledge in the whole sector. The Task Force received a special briefing on the Productivity Aerospace Program and endorsed as a priority its aims and actions.

Members observed the need for more active participation by organized labour in the program, and for industry and government to accelerate computer-aided design and computer-aided manufacturing applications (CAD/CAM).

Detailed Recommendations

The Task Force recommends that:

Industry, with government assistance and participation by organized labour, continue to give a high priority to its productivity improvement measures (Productivity Aerospace Program).

Industry and government with assistance from universities where appropriate, take special measures to increase the use of the computer in design and manufacturing.

REGIONAL DEVELOPMENT

Discussion

Due to factors of availability of skills and infrastructure associated with this advanced technology industry sector, the industrial action tends to be centred in the well established centres of Montreal, Toronto and to a lesser extent, Winnipeg. It may not be economically feasible to disperse the core of the industry as a means of contributing to regional development goals. In examining the potential for regional development, strong concern was expressed that new companies should not be encouraged by governments to enter aerospace markets if such entry was at the expense of existing Canadian companies. It was thought, however, that in the location of non-aerospace work captured as offsets to aerospace procurement abroad, the smaller companies in regional locations outside the main centres could be given preference.

The Task Force also considers that the larger Canadian companies should adopt a stronger policy of sourcing their outside purchased materials, parts and services in Canada. A policy of government and industry assistance to upgrade small companies for this type of work is desirable.

Detailed Recommendations

Within the foregoing limitations, the Task Force recommends the following actions:

Governments should not attempt a dispersal of the core of the industry from the present centres if this requires subsidization to obviate the introduction of uneconomic factors of marketing and production, or if it merely transfers or dilutes the share of available work.

Governments should seek a more balanced regional spread of the industry by supporting the generation of new 3rd tier aerospace companies against new additional work opportunities, by:

- Identifying, with a lead by the larger companies, new market areas, e.g. by substitution of imports of fastenings, cutting tools and short-run materials.

- Assisting in the upgrading of existing small businesses in the areas of quality control, training, acquisition of capital equipment and more efficient regionalization of federal government financial assistance services.

NEED FOR CONTINUING CONSULTATION BETWEEN INDUSTRY, FEDERAL AND PROVINCIAL GOVERNMENTS, ORGANIZED LABOUR AND ACADEMIC INSTITUTIONS

Discussion

The Task Force discussions disclosed a mutuality of interest between all parties in achieving long-term growth and stability for the aerospace manufacturing sector. The desire to continue the consultation with the federal government was strongly evident.

Detailed Recommendations

Accordingly the Task Force recommends that the in-depth process of consultation between industry, governments, organized labour and the academic community be continued to :

- delineate areas of individual and collective interests and responsibilities,

- develop and quantify the recommended action areas and to monitor and assist in the implementation process.

SUMMARY OF RECOMMENDATIONS

The Task Force made the following recommendations, that:

- The federal government recognize that the Aerospace Manufacturing Industry is well established as a high technology sector with excellent prospects for economic growth and accept the framework of strategic objectives as a charter for its continued support of an integrated aerospace industry in Canada.

- The process of consultation between all parties in the Task Force be continued and enhanced and an implementation program outlined with detailed objectives and target dates.

The federal government should establish a policy for the Department of Defence to earmark a fixed portion of its budget to be spent in Canadian industry for advanced technology equipment and research and development so as to provide a reasonable stimulus to its technology similar to that enjoyed by our NATO partners.

- The future human resource needs of the industry be audited and urgent steps taken to ensure that they can be primarily sourced in Canada.

- Restrictions which have developed to technology transfer, primarily with the U.S., should be eliminated by negotiating a return to the spirit of free exchange of technology in international co-operative agreements and an enhanced development of technology in Canadian industry as a basis for sharing knowledge.

- The federal government financial support of Canadian specialized aircraft, engines, systems and sustaining research and development be maintained.

- The modernization of the industry's production capability should be increased with government support.

- There should be a negotiated liberalization and expansion of trade in civil aerospace products and services.

- Government procurement should be used as a tool to support the industry and to assist in demonstrating its products to world markets.

- Regional dispersion of existing companies in the Montreal, Toronto and Winnipeg centres should not be encouraged, instead consideration should be given to finding new work which can be performed by upgraded small companies in other regions.

- The industry's productivity improvement programs be continued in the longer term to assure its international competitiveness.

June 30, 1978

D.C. Lowe
Chairman

ANNEXES

A. Membership of the Aerospace Manufacturing Sector Consultative Task Force

B. Minority Reports

C. Labour Report to Co-ordinating Committee

D. Acknowledgements

ANNEX A

MEMBERSHIP OF THE AEROSPACE MANUFACTURING SECTOR CONSULTATIVE TASK FORCE

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ANNEX B-1

MINORITY REPORT BY MR. M. RYGUS, VICE-PRESIDENT GENERAL
INTERNATIONAL ASSOCIATION OF MACHINISTS AND AEROSPACE WORKERS

I am asking that I not be identified with the Task Force Report on the Aerospace Industry because it does not fully reflect my views in several areas.

The report does not deal adequately with the fundamental issues of industry structure. Several of the recommendations seek government financing which would have a net result of increasing profits. I am not convinced that corporate tax rates are too high. In recent years corporate tax rates and other incentives have been substantially reduced and the lower corporate share of total tax revenue means that individuals must carry the higher portion.

There is need for expanded and more effective research and development activities in this industry, however the government must be assured that public funds are used to bring significant industrial benefits to Canada.

My views on the Manpower Training Program are attached.

The Canadian Labour Congress has prepared a comprehensive report which will deal with these and other relevant issues in your report. I am therefore requesting that your committee accept the CLC report as my statement on the Aerospace Sector Task Force Report.

MANUFACTURING INDUSTRY SKILLED TRADES TRAINING PROGRAM

1. Secondary Schools

   (a) Guidance counselling should be upgraded. Students should be encouraged to choose a career based on their talents rather than the social or financial status of the job. Students should be given a clear picture of the job opportunities and the requirements, wages and employment conditions in the various jobs.

   (b) Job training programs should be offered in the first year of the secondary school.

   (c) High standards should be maintained for technical teachers and their skills should be upgraded from time to time to keep up with new technology.

   (d) Students should be given a broad-based training so that they can adapt to changing technology in future years. They should be taught maths, sciences and drafting as well as the basic bench, machine and equipment work that is related to the trade.

   (e) Apprenticeship training should be recognized as part of our educational system.

   (f) Shops in secondary schools should be equipped with basic modern machinery and technology.

2. Community Colleges

   (a) A two- or three-year, broad-based, work-simulated training program consisting of machine and equipment shops, bench work, drafting and design, and science subjects.

   (b) Community colleges should be staffed with competent instructors and equipped with modern machines and technology.

3. On-the-Job Training

(a) Graduates of secondary schools (technical trades training) and two to three years related training in a community college would be given up to two years of credit towards a four-year apprenticeship program.

(b) At least two years of on-the-job training would be necessary to qualify for such trades as tool and die maker, general machinist, fitter, maintenance trades (electrician, millwright, pipefitter, etc.) instrument mechanic, electronic technician and so forth.

(c) Successful graduates would receive a Certificate of Competency in the trade.

(d) A special fund should be established for skilled trades training into which manufacturing companies would contribute a payroll tax. Apprenticeship training costs should be paid from this fund to employers who establish and operate a recognized apprenticeship training program as well as for a recognized retraining and upgrading program when new technology is introduced in the plant.

4. General

(a) We need a co-ordinated manpower training investment policy that will train Canadian youth and adults and produce an adequate supply of skilled tradesmen.

(b) This program should involve federal and provincial governments, the education institutions, labour and management.

(c) All manufacturing industry trades, such as tool and die makers, machinists, fitters, maintenance trades, instrument mechanics, electronic technicians, etc., should be designated as apprenticed trades. The standards for each trade should be uniform in each province so that a journeyman in one province is recognized as such throughout Canada.

(d) The government should maintain an inventory of employees in the skilled trades -- the number in each trade by age groups. Industry should provide five-year manpower forecasts so there can be better planning of our manpower training programs.

(e) The government should pay for moving allowances and short-term rental allowances to encourage moving to suitable jobs.

ANNEX B-2

SUPPLEMENTARY REPORT BY MR. J. GILL,
CITIZENSHIP AND LEGISLATIVE DIRECTOR FOR CANADA,
INTERNATIONAL UNION, UNITED AUTOMOBILE,
AEROSPACE AND AGRICULTURAL WORKERS OF AMERICA (UAW)

Background

This, and other Task Forces, were set up initially with little or no consideration given for input from organized labour.

This appears to be a continuation of an admitted past practice of the aerospace industry and the federal government having ongoing discussions that exclude organized labour.

Upon the insistence of the Canadian Labour Congress, organized labour was able to participate on a minority basis. However, this was after the initial meeting of this Task Force at which the direction and objectives were decided -- objectives that are in my opinion limited, and to a large degree serving only industry.

An attempt was made to widen the scope of the discussions to cover areas important to labour -- i.e. rationalization of the industry, material costs, public equity, effect of foreign ownership, expanded markets (other than U.S.), etc.

This did not happen and as a consequence I am submitting my comments at this time which can be classified as a minority, or supplementary report or any other designation the chairman or committee wish to affix to it.

Notice of supplementary comments was given to the committee at its last meeting by myself and the other labour member of the committee, Mike Rygus of the IAM. We also stated that the Canadian Labour Congress would be submitting a statement covering the areas discussed by all sector task forces which will be the official response from organized labour.

1) State of the Industry

While the aerospace industry is indeed in a growth cycle at the present time, one must reflect on its depressed state over recent years and the possibility of a re-occurrence of a similar slump in the future. It must be recognized that the present and anticipated activity is largely predicated by government expenditures, both civil and military, and the role government plays in the future will without doubt determine the health of the industry. Industry indicates loud and clear that it wants government assistance. However, we are also made aware that industry wants this assistance on its own terms which may satisfy its needs but places the interest of the Canadian economy, in my opinion, in a secondary role.

With the anticipation of continued government financial contributions to the aerospace sector, closer attention must be given to direct government interventions in day-to-day operations and long-range planning, whether by public ownership or other means.

2) Rationalization of Industry

If we are to ever achieve any degree of stability in the aerospace industry then it must come about by measures designed to achieve that purpose over the long run and not short-term profit making steps. This may require:

a) Consolidation by mergers or co-operative ventures as we now see in Europe, and earlier consolidation proposals in Canada. This would allow for integration of expensive R and D, engineering, marketing operations, etc., instead of duplication, the rationalization of production facilities.

b) Ownership

With the government controlling two large facilities, Canadair and de Havilland and with it being the largest purchaser, not to mention the generous grants given from time to time from the public purse, it makes eminent sense for the government to ensure that

the public's interest is protected by an even larger degree of public ownership or control.

This would ensure that public monies in the form of grants would not be utilized outside the country as has happened in the past. It would also facilitate the possibility of greater regional distribution of production activity. Strong resistance must be mounted against the present cry for re-privatization of aerospace entities now under government control. The public stepped in to rescue ailing operations. The public should now share in the rewards of boom times.

c) Diversification

Now is the time to plan for rapid conversion of facilities to meet other public needs such as rapid transit vehicle production to allow for not only a cushion during downturns in aerospace production, but also to assist in developing a sound and sensible transportation policy to serve the real needs of the Canadian people.

3) Material Costs

This Task Force discussed at length labour costs, productivity and other items that are reflected in final costs. However, scant attention was given to the practice of sourcing parts outside Canada, which it was alluded make up from 40 per cent to 70 per cent in dollar value of many components and finished products. If correct, this is a most glaring omission from this study for which no excuse is readily apparent, consequently calling into doubt the validity of the Task Force report.

To rectify this it is recommended that immediate attention be given to discovering:

a) The extent of out-of-country purchasing of parts and components for use in Canadian manufacturing.

b) If this is a result of parent company policy.

c) The potential for the production of these parts and components in Canada.

4) Skilled Manpower

Industry in Canada is finally recognizing the shortcomings of its previous obstinate stance in refusing to implement meaningful apprentice training programs as proposed by organized labour over many years.

Industry has profited from this stand much to the detriment of public good. Therefore, it is not too much to ask for industry to now make amends by assisting in the financing of skills training through a vastly enlarged apprentice program in relation to their use of skilled trades.

5) World Markets

Attention must be given to enhancing the possibilities of expanded sales throughout the world consistent with existing government policies, so as not to continually depend on U.S. needs which leave the Canadian aerospace sector at the mercy of the fluctuations of a single market.

6) Military vs Civil Requirements

It would be unwise to expect a continued expansion of military expenditures to guarantee the viability of our aerospace industry unless this is transacted into export items. Resistance to military spending at home and a desire of all industrial countries to manufacture their own military needs leads one to believe that greater emphasis on civilian aircraft production is recommended for the future.

The preceding remarks constitute some areas of concern to me which relate to the aerospace industry and will be supplemented by Mike Rygus, the other labour member of the Task Force.

The Canadian Labour Congress submission will deal with, among other issues, the overall economy and the need for a realistic industrial strategy for Canada which impact on the

aerospace industry and I urge all Task Force members give serious consideration to its recommendations.

I remain available for further discussion if deemed necessary.

ANNEX B-3

COMMENTS OF THE AEROSPACE MANUFACTURING SECTOR
CONSULTATIVE TASK FORCE ON THE MINORITY REPORTS

Introduction

The Minority Reports were tabled and discussed at a meeting of the Task Force held on July 24, 1978. Mr. M. Rygus was present but Mr. J. Gill did not attend.

Mr. Rygus' Report

The members agreed generally with Mr. Rygus' recommendations on training programs for manufacturing industry skilled trades. The need for expanded and more effective research and development activities in the industry which can result in significant industrial benefit to Canada was also endorsed.

The Task Force majority did not support Mr. Rygus' views on the linkages between corporate taxation, profit levels and the Task Force recommendations covering government financing.

Mr. Gill's Report

The Task Force had some difficulties in its consideration of Mr. Gill's report.

The basic feeling of members was that many of Mr. Gill's remarks were based on a misinterpretation of the nature of the industry.

The introduction to Mr. Gill's report also disclosed misunderstandings of the role of the union members on the Task Force. Union membership was, in fact, invited prior to the start of the consultative process and in no sense was the union membership conceived or established on a minority basis.

Several members pointed to inaccuracies in the minority report; for example, the implication that government is the principal customer of its products which, with 70 per cent of sales exported, is clearly wrong.

The Task Force felt that a further discussion with Mr. Gill at the meeting of July 24, 1978, could have resolved certain differences of fact and opinion. Unfortunately, this opportunity for further consultation was lost since Mr. Gill could not attend the meeting.

ANNEX C-1

THE LABOUR REPORT

TO THE CO-ORDINATING COMMITTEE

FOR THE 23 INDUSTRY SECTOR TASK FORCES

Research and Legislation Department
Canadian Labour Congress
July, 1978

Report tabled at the Fifth Meeting of the Aerospace Manufacturing Industry Consultative Task Force, July 24, 1978, by Mr. M. Rygus, Member, General Vice-President for Canada, International Association of Machinists and Aerospace Workers.

Comments by the Task Force on the Labour Report are recorded at Annex C-2.

TABLE OF CONTENTS

INTRODUCTION

This report prepared by the CLC Research and Legislation Department is meant to complement the input of the CLC's affiliated unions in the task forces on individual manufacturing industries set up after the February 1978 meeting of the first ministers. It looks at the manufacturing sector as a whole and at policy issues that cut across several industries. The Canadian Labour Congress has participated actively in the task force exercise. However, it feels strongly that the time dimension that was imposed on the exercise by the federal government was wholly unrealistic. In a real sense, all reports should be considered interim ones, and the process of consultation on a restructured basis should be a continuing one.

Our report consists of four sections. Section I discusses the importance of the manufacturing sector in attaining several of Canada's social and economic goals. This section emphasizes the important link between a strong and diversified manufacturing sector and the goals of greater employment growth, increases in standards of living, a reduction of regional disparities, and an improvement in the balance of payments.

Section II outlines the basic problems in the manufacturing sector and analyzes the causes of these problems. The section examines the following specific issues: profitability, competitiveness, diversification, scale, trade barriers, transportation, research and development, energy and labour supply.

Section III outlines the policy recommendations that arise from the analysis of the causes of the problems. It particularly examines the role to be played by general policy, particularly the traditional monetary and fiscal policy tools, versus more specific structural policies.

Section IV deals with the role the government must play in implementing these policy recommendations. It specifically examines whether incentive based policies for the manufacturing sector are sufficient or whether government must play a more active and directive role in the improvement of performance in the manufacturing sector.

I The Importance of the Manufacturing Sector

The strengthening and diversification of the manufacturing sector is closely related to the attainment of a number of Canada's social and economic objectives. Of fundamental importance, in both a social and economic sense, is the relationship that exists between an expanded manufacturing sector and the attainment of full employment in Canada. However, the development of a stronger and more diversified manufacturing sector can also contribute in an important way to reductions in regional disparities, to improvements in the balance of international payments and to increases in standards of living.

1. The Relationship to Job Creation

Unfortunately, the crucial role that the manufacturing sector must play if full employment conditions are to be established in Canada is often overlooked. A particularly deceptive argument in this context is the view that a declining manufacturing sector in terms of its share of total employment is a perfectly natural part of the transition to a so-called "post-industrial" society. This point of view begs the question as to how an economy can move from a resource-based one to a service-based one without ever having really gone through the intermediate stage of having developed a strong manufacturing sector.

The crucial nature of manufacturing as an engine of economic growth and job creation can be readily illustrated. In Table 1, data is presented to indicate how many indirect jobs are created when one job is created in individual economic sectors. The manufacturing sector is the most important generator of indirect jobs - almost three jobs are created indirectly for every direct job created. This illustrates that manufacturing in a real sense stands at the centre of the economic process - when manufacturing activity expands, demand is created backward in terms of primary sectors supplying materials, and forward in that income generated in the goods sector is the most important basis for consumer demand for the output of the services sector.

TABLE 1

The Indirect Employment Effects of Direct Job Creation in the Major Economic Sectors - 1970

	(Number of indirect jobs[1] created for each direct job created)
Agriculture, Fishing and Forestry	0.81
Mines, Quarries and Oil Wells	2.58
Manufacturing	2.64
Construction	2.22
Services	1.55

(1) Indirect employment includes the employment arising from the production of inputs for the initial production as well as the employment arising from the production of goods and services demanded by the households receiving income from the initial production.

Source: Statistics Canada, Input-Output Division.

The crucial role of the manufacturing sector can also be illustrated in terms of data on the relationship between investment and jobs. The relevant question here can be phrased: where do investment dollars have the greatest impact in terms of job creation? Table 2 shows that, with the exception of the construction sector, manufacturing scores highest on this count: on average over the 1966-75 period, a million dollars of capital stock in manufacturing was associated with 57 jobs.

TABLE 2

The Direct Employment Effects Related to Investment in the Major Economic Sectors - 1966-1975

(employment per million dollars of capital stock)

	1966-75	1971-75
Agriculture, Fishing and Forestry	53	42
Mines, Quarries and Oil Wells	11	9
Manufacturing	57	47
Construction	288	248
Services	38	32
All Industries	44	37

Source: Statistics Canada, Capital Stocks and Flows (Cat. No. 13-211)
Statistics Canada, The Labour Force (Cat. No. 71-001)

The data in Tables 1 and 2 in combination illustrate the important leverage role played by the manufacturing sector. When investment occurs in the manufacturing sector, a relatively large number of direct jobs are created. In turn, when direct jobs are created in the manufacturing sector, a relatively large number of indirect jobs are created. It is therefore essential that the manufacturing sector, with its superior direct and indirect employment benefits, be developed to the greatest extent possible. This expansion must not only be in terms of an expansion of existing manufacturing industries, but also a diversification of the manufacturing sector into new areas.

2. The Relationship to Standards of Living

The relationship between manufacturing sector growth and the potential for increases in standards of living is also clear from the available data. Table 3 indicates that the income-generating impact of the manufacturing sector is higher than for all other economic sectors. The manufacturing sector is the strongest contributor to productivity growth which is the basis for increases in the standard of living.

TABLE 3

Income Multipliers[1] in the Major Economic Sectors - 1971	
Agriculture, Fishing and Forestry	2.49
Mines, Quarries and Oil Wells	2.15
Manufacturing	3.45
Construction	3.12
Services	2.53

(1) The income multiplier includes the income that results from the production of the inputs for the initial production and of the outputs demanded from the individuals earning income from the initial production. It is calculated as the ratio:

$$\frac{\text{\$1 million and indirect income}}{\text{\$1 million}}$$

Source: Statistics Canada, Input-Output Division.

3. The Relationship to Regional Development

The importance of manufacturing to the alleviation of regional disparities follows directly from its role in job creation and income generation, as discussed in the two previous sections. There is a further dimension to the manufacturing sector that makes it particularly important in terms of alleviating regional disparities - namely, it is a relatively "footloose" sector. Primary and tertiary sectors to a large extent have their location predetermined: resource industries locate where the resources are, and tertiary industries follow from other industrial activity.

The "footlooseness" of manufacturing activity was the basic rationale of the industrial incentives programme operated by the Department of Regional Economic Expansion. The theory was that an "incentive" could be given to overcome the cost disadvantages of locating in the lagging regions. In other words, an industry that might have located in the industrial heartland - say Toronto - would now locate in a lagging region - say the Atlantic.

In practice, things haven't worked out this way. The value of the average incentive given by DREE - when expressed in terms of its long-run cost-offsetting ability - falls far short of the cost disadvantages of locating in designated regions. Transportation costs for shipment of goods from say the Atlantic to central Ontario are in general far more significant than the incentive grant.

The question that is begged by all of this, however, is: how does one explain the high level of activity under the incentives programme and the negligible impact on regional manufacturing employment trends? From 1969 to 1975, for example, DREE claimed to have given grants that would create just short of 24,000 jobs in the Atlantic provinces. Yet data on manufacturing employment for the Atlantic Provinces yields no evidence of such an impact. Manufacturing employment in the Atlantic Provinces has been stable over the 1970's at a level of about one hundred thousand.

The co-existence of a high level of DREE incentive assistance in the Atlantic region with virtually no manufacturing employment growth is easily explained. New firms enter industries and existing ones expand all the time in any region - in a stagnant sector, such as manufacturing in the Atlantic region, the new activity is offset by plant closures and layoffs. DREE has largely supported new activities that would have occurred anyway - industries serving a local market such as bakeries and industries based on local resources such as sawmills and fish processing.

For manufacturing investment that is truly incremental to be attracted to regions such as the Atlantic, incentives are required of sufficient size to overcome natural cost disadvantages related particularly to distance from central markets. This does not necessarily imply that more money has to be spent on such incentives than currently, but merely that it should be more concentrated on individual projects. With such an approach, however, there is a real danger that large windfall gains would accrue to projects where the determination of incrementality was next to impossible. As a safeguard, and given that such public expenditures are undertaken to begin with for social reasons, government should establish an equity position in projects in exchange for financial assistance.

4. The Relationship to the Balance of International Payments

Finally, a stronger and more diversified manufacturing sector can play an important role in an improvement in the Canadian balance of international payments in terms of increases in export growth and/or reductions in import growth of manufactured goods. Table 4 shows that the highly manufactured goods (end products) deficit has in the past contributed to the chronic deficit on current account.

TABLE 4

Trade Balances in the Manufacturing Sector

1963-77

	Fabricated Materials	End Products	Fabricated Materials and End Products
	(in millions of dollars)		
1963	1,536	- 2,393	- 857
1964	1,689	- 2,592	- 903
1965	1,614	- 3,176	-1,562
1966	1,779	- 3,346	-1,567
1967	1,919	- 3,434	-1,515
1968	2,420	- 3,342	- 922
1969	2,258	- 3,567	-1,309
1970	2,981	- 3,067	- 86
1971	2,657	- 3,639	- 982
1972	2,999	- 4,812	-1,813
1973	3,942	- 6,411	-2,469
1974	4,214	- 9,125	-4,911
1975	3,918	-10,197	-6,279
1976	5,931	-10,250	-4,319
1977	7,915	-11,097	-3,182

NOTE: (-) denotes deficit

Source: Statistics Canada, Quarterly Estimates of Canadian Balance of International Payments (Cat. No. 67-001) Statistics Canada, Trade of Canada (Cat. Nos. 65-004, 65-007).

The manufacturing trade picture is particularly important from the point of view of jobs and the goal of full employment. Even if Canada's deficit in manufactured goods were covered by a corresponding surplus in resource products, all is not necessarily well. Trade balances are calculated in money terms; but it is crucial to think of them in job terms as well. A situation like the one described - a manufactured products deficit covered by a resource products surplus in dollar terms - actually involves a job deficit. This follows from the labour-intensive nature of the manufacturing sector relative to other sectors. It has been estimated that the deficit in end products represents a potential employment opportunity of 170,000 jobs.*

* "Immediate Actions for Job Creation", Ontario presentation to Federal-Provincial Conference of First Ministers, Feb. 13-15, 1978.

II The Analysis of the Problems in the Manufacturing Sector

The problems facing the manufacturing sector at the present time partially reflect long-run secular factors intrinsic to the sector and partially reflect the impact on the sector of the general depressed state of the economy. Because of the nature of the task force exercise and its particular emphasis on structural issues, we have not dealt extensively with the cyclical dimension.

Table 5 indicates that the contribution of the manufacturing sector to total gross domestic product has declined steadily. Put another way, the rate of growth of gross domestic product originating in the manufacturing sector has consistently been below the rate of growth of total gross domestic product. There is a similar problem on the investment side. Table 6 indicates a deterioration in the share of total investment going to the manufacturing sector, particularly in the last decade.

TABLE 5

Production Trends in Manufacturing - 1958-1976

	Average Annual Increase in Manufacturing Gross Domestic Product (at factor cost)	Manufacturing Gross Domestic Product as a Per Cent of Total Gross Domestic Product
1958-67	5.7	23.5
1968-76	10.5	22.6
1973-76	9.4	21.9

Source: Statistics Canada, National Income and Expenditure Accounts (Cat. No. 13-201)
Statistics Canada, Indexes of Real Domestic Product by Industry (Cat. No. 61-005).

TABLE 6

Investment Trends in Manufacturing - 1958-1976

	Average Annual Increase in Manufacturing Investment	Share of Manufacturing Investment in Total Investment
1958-66	7.7	19.0
1967-76	6.1	22.6
1972-76	12.3	17.6

Source: Statistics Canada, Capital Stock and Flows (Cat. No. 13-211).

This relative deterioration in manufacturing production and investment has clearly affected the employment growth of the manufacturing sector. As Table 7 indicates, both the average annual rate of growth of manufacturing employment and the share of manufacturing employment in total employment have declined over the last 20 years. In fact, manufacturing employment was lower in absolute terms in 1977 than it was in 1974. Some of the recent deterioration is attributable to cyclical factors, but clearly there has been a chronic problem in terms of the declining importance of the manufacturing sector in total employment.

TABLE 7

Employment Trends in the Manufacturing Sector - 1958-1977

	Average Annual Increase in Manufacturing Employment	Manufacturing Employment as a Percentage of Total Employment
1958-67	2.0	24.2
1968-77	0.9	21.5
1973-77	-0.2	20.8

Source: Statistics Canada, The Labour Force (Cat. No. 71-001).

Finally, Table 8 points out the persistent trade deficits that have characterized the manufacturing sector. These trade deficits have been put in perspective by relating them to Gross National Product. In 1977, the trade deficit in end products amounted to more than 5 per cent of GNP. It had been considerably below this in the late 1960's and early 1970's. The percentage in 1977 was only marginally above the percentage in 1963. But it should be pointed out that these two years are not strictly comparable because of the influence of the business cycle. In 1963, Canada was in the middle of a cyclical expansion, and in 1977 Canada was in the middle of a cyclical contraction. There is a clear tendency for the size of the deficit in end products related to GNP to increase in the expansionary phase of the business cycle and lessen in the contraction phase.

TABLE 8

Trade Balances in Manufacturing as a Per Cent of Gross National Product - 1963-1977

	Fabricated Materials	End Products
1963	3.34	-5.20
1964	3.36	-5.16
1965	2.92	-5.74
1966	2.88	-5.41
1967	2.89	-5.17
1968	3.33	-4.60
1969	2.83	-4.47
1970	3.48	-3.58
1971	2.82	-3.87
1972	2.87	-4.60
1973	3.22	-5.23
1974	2.91	-6.31
1975	2.43	-6.33
1976	3.21	-5.56
1977	3.81	-5.34

NOTE: (-) denotes deficit

Source: Statistics Canada, Quarterly Estimates of Canadian Balance of International Payments (Cat. No. 67-001). Statistics Canada, National Income and Expenditure Accounts (Cat. No. 13-201).

In order to arrive at the specific policies that are necessary to deal with these problems in the manufacturing sector, the causes of these problems must first be analyzed. A number of possible causes of these problems have been the focus of recent debates in Canada. The 22 sector discussion papers have in fact attempted to summarize some of these possible causes, both at the individual sector or industry level and at the overall manufacturing level (the Manufacturing Performance discussion paper).

This section will first deal with some erroneous explanations of the causes of the problems in the manufacturing sector. Then, on the more positive side, it will outline the more relevant explanations of these causes.

1. Some Erroneous Explanations of the Causes

a) The Profitability Problem

One of the erroneous explanations that is often heard is that the investment and

employment problems in the manufacturing sector have been the result of inadequate profitability. It is argued that the rates of return on past investment are too low to justify new investments and to provide enough funds to finance new investments. Moreover, we are told that this inadequate profitability is primarily the result of structural factors such as excessive wages, taxes, and government regulations. There are however a number of major problems with this explanation.

A first problem with this explanation is that investment decisions are not determined by the current rates of return on investment and/or profit levels. Instead, they are determined by the expectation of future flows of profit which are primarily dependent on future demand. This is particularly relevant in the present situation where most of the goods producing industries, and manufacturing industries specifically, are operating at the lowest rates of capacity utilization since the statistics were first compiled in 1961 (see Table 9). Under these conditions, where the existing capacity is not being fully utilized, there is no reason for firms to invest in new capacity even if current costs are reduced through wage restraint, tax cuts and/or reductions in government regulations.

TABLE 9

Capacity Utilization Rates in Canadian Industry 1961-1977

	Total Industrial	Manufacturing
1961	88.5	85.6
1962	89.8	87.6
1963	89.6	87.7
1964	92.1	90.6
1965	94.3	93.5
1966	95.5	95.2
1967	94.0	93.2
1968	94.7	93.8
1969	95.6	95.8
1970	92.0	90.0
1971	91.3	90.4
1972	92.8	92.1
1973	95.7	93.5
1974	93.8	93.5
1975	85.1	85.1
1976	85.2	85.5
1977	84.2	84.5

Source: Department of Industry, Trade and Commerce, Economic Analysis Branch.

The case against wage restraint as a means of encouraging investment can be made by looking at the other side of wages - not as a cost but as a source of demand. Each percentage point of total wages and salaries is equivalent to more than one million dollars worth of purchasing power. Wage restraint is a completely self-defeating approach to encouraging investment - this has been amply demonstrated in the "controls" period.

Another problem with the "low profitability" explanation of the causes of the investment and employment problems in the manufacturing sector is that it is not evident that wage and tax costs and government regulations have been and continue to be excessive. In evaluating the level and/or growth of wages, taxes and government regulations, it is important to analyze these variables in an appropriate economic and social perspective. In the case of wage growth since 1974, it is important to keep in mind that wage growth is very much affected by the level of economic activity. During the rapid expansion of the 1971 to 1974 period, profits recorded unprecedented gains while wages lagged behind.

After profits peaked in 1974, wages continued upward in the normal "catch-up" fashion, which is typical of business cycle behaviour. The unusual occurrence this time around was that wages also tried to keep pace with rapid price increases, which originated outside the Canadian economy (OPEC oil increases and commodity speculation). This catch-up attempt was evident in wage settlements that took place in 1974 and early 1975. Unfortunately, this time around wages were not allowed to "catch up" as a result of the imposition of wage controls. In fact, the data for 1977 and partial data for 1978 clearly indicate that wages in real terms have been falling.

The ultimate test of the "low profits due to high costs" line of argument is the data itself. As indicated in Table 10, the argument falls on this basis. Obviously, the rates of return on investment have declined since the peak of 1974. However, this is the result of the slowdown in economic activity since 1974 and not the result of excessive wage growth, taxes and/or government regulations. In other words, the recent decline in the rate of return on investment has been a cyclical and not a structural problem. Nevertheless, rates of return in each year from 1973 to 1977, exceeded the rate of return in any year from 1957 to 1972.

TABLE 10

Rates of Return (After-Tax Profits) on Equity in Manufacturing - 1957-1977

	Rate of Return on Equity
1957	8.0
1958	7.1
1950	7.6
1960	6.7
1961	6.1
1962	9.2
1963	10.3
1964	11.1
1965	11.2
1966	11.7
1967	9.2
1968	10.0
1969	10.3
1970	7.4
1971	9.6
1972	11.1
1973	14.6
1974	16.9
1975	13.6
1976	12.2
1977	12.6

Source: Statistics Canada, Corporation Financial Statistics (Cat. No. 61-207)
Statistics Canada, Industrial Corporations (Cat. No. 61-003).

b) The International Competitiveness Problem

A second related and erroneous explanation that is often offered is that the trade

deficit, investment and therefore employment problems in the manufacturing sector have been the result of a lack of international competitiveness. Again, it is argued that this lack of international competitiveness is the result of higher wage levels, tax levels and/or more restrictive government regulations in Canada relative to other countries and especially relative to the United States, our largest trading market.

There are many conceptual and statistical problems with the usual analysis of this issue. One of the fundamental problems is that firms, and more specifically products, compete in foreign markets. As a result, there are major limitations to using highly aggregated industry averages to consider this question. Moreover, the regional dimension of international competition is very important. Another major conceptual problem is that the total costs of a product or firm must be considered in examining the competitiveness problem. As a result, we consider that the usual analysis in terms of unit labour costs and/or average hourly earnings comparisons are inappropriate. The statistics in Table 11 clearly indicate that direct labour costs account for less than 20 per cent of total costs of production, excluding capital and transportation costs. Moreover, over the period 1974 to 1976, the share of direct wages in total costs was lower than at any time during the 1965 to 1973 period. This completely undermines the argument that recent wage increases have contributed to the problems of the manufacturing sector.

TABLE 11

The Share of Direct Wage Costs in Total Costs of Production (Excluding Capital and Transportation Costs) in Manufacturing 1965-1976

1965	18.5
1966	18.5
1967	18.7
1968	18.6
1969	18.7
1970	19.0
1971	19.2
1972	19.2
1973	18.6
1974	17.5
1975	17.6
1976	18.0

Source: Statistics Canada, Census of Manufacturing (Cat. No. 31-203)

If aggregate statistics have to be used to analyze the international competitiveness question, there are more relevant statistics to consider than unit labour costs or average hourly earnings comparisons. It is more useful for example to compare final prices of exports and imports which better reflect total costs of production. Table 12 indicates that the growth of import prices of end products has exceeded the growth of export prices. This has been the case on average over the 1968 to 1977 period and for four of the last five years. The results for the last few years are particularly interesting. Exports of end products in volume terms expanded by an average 12½ per cent in 1976 and 1977. Import growth on the other hand grew by only about 4½ per cent. But because of the higher rate of price increase for imports, and because imports grew from a higher base than exports, the trade deficit expanded.

TABLE 12

Price Indexes for Imports and Exports of End Products - 1968-1977

(Current Weighted Price Indexes - 1971 = 100)

	Imports		Exports	
1968	94.3		92.4	
1969	96.7	(2.5)	94.0	(1.7)
1970	98.1	(1.4)	97.8	(4.0)
1971	100.0	(1.9)	100.0	(2.2)
1972	102.1	(2.1)	102.1	(2.1)
1973	105.4	(3.2)	104.5	(2.4)
1974	115.8	(9.9)	114.7	(9.8)
1975	135.6	(17.1)	127.5	(11.2)
1976	139.1	(2.6)	134.1	(5.4)
1977	155.5	(11.8)	143.9	(7.3)
1968-77		(5.7)		(5.0)

Source: Statistics Canada, Summary of External Trade (Cat. No. 65-001)

Based on this evidence, we cannot help but conclude that in general an international competitiveness problem does not exist. Some industries or products might be facing competitive problems, but as we shall discuss in Section III, there is no justification for general policies that restrain wages and reduce taxes and government regulations on this basis. The deficit in end products has not been worsened by reductions in export growth but by the growth in end product imports. (See Tables 13 and 14). These trends point to the problem of a lack of diversification in the manufacturing sector, which necessitates the importation of a wide range of manufactured goods, and not to a problem of international competitiveness. This problem will be dealt with later in this section.

TABLE 13

End Product Export Trends - 1968-1977

	Value of End Product Exports	Volume of End Product Exports
	(percentage change from previous year)	
1969	25.2	20.1
1970	3.2	0.2
1971	11.6	9.2
1972	15.2	12.8
1973	17.5	14.9
1974	10.1	0.3
1975	13.2	1.9
1976	19.9	14.0
1977	18.9	11.1
1968-1977	14.5	9.2
1972-1977	15.9	8.2

Source: Statistics Canada, Summary of External Trade (Cat. No. 65-001)
Statistics Canada, Trade of Canada (Cat. No. 65-004).

TABLE 14

End Product Import Trends - 1968-77

	Value of End Product Imports	Volume of End Product Imports
	(percentage change from previous year)	
1969	16.6	14.7
1970	-3.0	-4.4
1971	14.1	11.1
1972	21.5	19.0
1973	23.8	20.0
1974	23.9	12.8
1975	12.7	-3.5
1976	10.3	7.2
1977	14.1	2.2
1968-1977	14.6	8.4
1972-1977	16.8	7.5

Source: Statistics Canada, Summary of External Trade (Cat. No. 65-001)
Statistics Canada, Trade of Canada (Cat. No. 65-007).

The issue of international competitiveness aside, there is a further problem with this explanation of the trade deficit, investment and employment problems. It is not evident that Canada's labour costs or its taxes and government regulations (including social programmes) are greater than those of other countries.

In the case of labour costs, Table 15 shows that total hourly compensation in Canadian manufacturing, when measured in U.S. dollars (adjusted for changes in the exchange rate), was 12 per cent lower than in the U.S. in 1976.* On the productivity side, the Conference Board in Canada recently estimated that the manufacturing productivity gap vis-à-vis the U.S. was about 20 per cent in 1974. However that gap has been narrowing steadily over time and would be significantly less now. In 1977, as indicated in Table 16, Canadian productivity increased at twice the U.S. rate. Unit labour costs declined by almost 2 per cent in Canada in 1977 and increased by almost 7 per cent in the U.S.

TABLE 15

Total Hourly Compensation in Manufacturing
(in U.S. dollars)

	All Workers		
Country	1970	1974	Preliminary 1976
Canada	3.66	5.47	7.05
France	2.09	4.05	5.47
Germany	2.24	5.29	6.39
Italy	2.13	4.32	5.21
Japan	1.11	2.92	3.60
Netherlands	2.30	5.77	7.48
Sweden	3.33	6.42	9.65
Switzerland	2.28	5.35	6.92

Country	1970	1974	1976
U.K.	1.65	2.88	3.34
U.S.	4.91	6.56	7.91

Source: Dept. of Industry, Trade and Commerce, Canadian Competitive Performance, May 1978.

* The Conference Board in Canada, Assessing Trends in Canada's Competitive Position, Nov. 1977, p. ix.

TABLE 16

Changes in Unit Labour Costs in Manufacturing 1976-77

Countries	Output Per Hour	Hourly Compensation	Unit Labour Costs (national currency)	Exchange Rate	Unit Labour Costs (U.S. dollars)
Canada	4.0	10.1	5.9	- 7.2	- 1.8
U.S.	2.2	8.8	6.5	--	6.5
Japan	6.1	9.6	3.3	10.7	14.4
France	3.8	12.6	8.5	- 2.9	5.4
West Germany	4.2	9.2	4.9	8.4	13.7
Italy	0.5	22.6	22.0	- 5.9	14.7
Sweden	2.4	12.5	9.9	- 2.5	7.1
U.K.	- 1.6	10.0	11.8	- 3.3	9.1
Denmark	- 1.5	8.2	9.9	- 0.7	10.7

Source: U.S. Bureau of Labor Statistics (Reported in Financial Times, May 22, 1978).

While 1978 statistics are not available, there is little doubt that they would undermine further the position of those who are arguing the "high wage cost" line in the task forces. The rate of wage increase will unfortunately have declined further in 1978 in view of the wage control programme and the high level of unemployment in Canada. Moreover, the exchange rate has continued to move in a direction that favours Canada's competitive position. The following is the ratio of the U.S. dollar to the Canadian dollar:

1977	-1.0635
1978-January	-1.1011
-February	-1.1132
-March	-1.1256
-April	-1.1416
-May	-1.1189

Source: Bank of Canada Review, June 1978, p. S113.

The Canadian dollar has appreciated slightly in recent months, but for 1978 as a whole the Canadian dollar will have depreciated by at least 4-5 per cent over 1977. In other words, on a common currency basis, the exchange rate will contribute a further 4-5 per cent reduction on Canadian unit labour costs.

We should also add that these comparisons are also biased against Canadian manufacturing because of a difference in the manner in which wages are measured from one country to another. Although total hourly compensation statistics take into account fringe

benefit differences, which are higher in U.S. manufacturing, they do not take into account differences in the size of the establishments that are surveyed. In Canada, average hourly earnings data cover establishments with 20 or more employees whereas data in the United States have no size limitation. It is generally acknowledged that earnings in small establishments are lower than in larger establishments, so that this difference in coverage between Canada and the United States involves a significant upward bias to the Canadian earnings data.

In the case of taxation and social security payments, OECD statistics indicate that Canada ranked 11th in 1975 (among OECD countries) in the total taxes, including the various social security contributions, as a percentage of Gross National Product (Table 17). It is important to note that countries such as West Germany, which have performed remarkably in international trade, are ahead of Canada on this list. Moreover, at a June 20, 1978, meeting of the Investment Dealers' Association of Canada, Finance Minister Jean Chrétien had the following to say about corporate tax rates specifically:

> "The fact is that corporations in Canada pay less tax on average than their American counterparts. Our corporation income tax as a percentage of book profits totalled 35.3 per cent last year. In the U.S. it was five points higher. Because the federal sales tax is generally not charged on goods which are exported, it favours companies competing internationally. Our depreciation provisions are generous: We apply our investment tax credit very broadly. We treat intercorporate dividends more favourably than the U.S. rules do."

TABLE 17

Total Taxes (including social security contributions) per cent of GNP at factor cost on national accounts basis)

	1975	
	Percentage	Rank
Australia	34.2	12
Austria	46.1	5
Belgium	44.7	6
Canada	37.7	11
Denmark	50.4	4
Finland	40.5	10
France	41.2	8
German Fed. Republic	41.9	7
Greece	27.2	16
Italy	34.0	13
Japan	22.4	17
Netherlands	53.1	2
Norway	54.9	1
Sweden	52.2	3
Switzerland	30.1	15
United Kingdom	40.8	9
United States	32.5	14

Source: OECD

2. Labour's Explanation of the Causes

If we are to deal effectively with the production, investment, trade deficit and employment problems in the manufacturing sector, the emphasis must be shifted away from wage and tax costs, and government regulations and social programmes as causes of these problems. The policies, implicit in these causes, only lower costs temporarily and do little, if anything, to increase production, investment and employment and to improve the trade deficit in the manufacturing sector.

Instead, the analysis must be centred on a number of other causes that have been responsible for the problems in the manufacturing sector. The most important of these causes are outlined below.

a) The Cyclical Problem

Over the last several years, the slow growth in total demand in the economy has affected production, employment and investment in the manufacturing sector. The most direct effect of the slow growth in demand has been a slowdown in the growth of production. In fact, as noted earlier, capacity utilization rates are at their lowest level since 1961 when the data were first published. This fact has contributed to the decline in manufacturing employment and the pattern of layoffs and shutdowns. The indirect effects, however, have been just as important. The low capacity utilization rates have also adversely affected the rate of investment in new capacity. Firms have not been willing to invest in new capacity because they have been in a position where they have not been fully using their existing capacity.

The primary reasons for the recent slow growth in demand have been domestic ones. Export growth over the last couple of years has been quite strong. However, government policies (both federal and most of the provincial) of wage and expenditure restraint have deliberately restricted the rate of growth in total demand. Wage restraint and rising unemployment have adversely affected consumption growth and to some extent investment growth (due to the uncertainty surrounding wage controls). Government expenditure restraint has slowed the growth of demand directly at a time when it should be doing the exact opposite.

The future with respect to this problem looks just as bleak. In the federal government's document Canada's Economy, Medium-Term Targets and Projections, the implication is that recent restraint policies must continue. Moreover, the export picture is clouded in view of developments in the U.S. market. The Organization for Economic Co-operation and Development predicted in its 1978 Economic Outlook that U.S. imports would grow by only 9 per cent in 1978 compared with 23 per cent in 1977. A deteriorating foreign market outlook combined with a continuing stagnant domestic market outlook does not augur well for the manufacturing sector.

b) The Lack of Diversification in the Manufacturing Sector

The lack of diversification of the manufacturing sector has historically limited production, investment and employment in the manufacturing sector. This problem has had an important adverse effect on the manufacturing trade deficit. It is this lack of diversification and not the lack of international competitiveness that has been responsible for the trade deficits in manufactured goods. The narrow base of the manufacturing sector has contributed to the manufacturing deficits by limiting the full exploitation of manufactured export potential and by forcing an excessive reliance on manufactured imports. The dependence on imports is obvious even in periods of high economic growth; in an investment surge, for example, imports of machinery increase very rapidly because Canadian producers can supply only a small part of domestic demand.

There have been two basic reasons for this lack of diversification of the manufacturing sector. One of these reasons is the lack of any effective coherent or co-ordinated national industrial planning by government in the past. It is important to keep in mind that, especially in this highly technological age, comparative advantage in manufacturing has for the most part been man made. It has not arisen solely, or even primarily, from natural forces. West Germany and Japan are strong evidence of this fact.

The diversification of the Canadian manufacturing sector has been impeded by several

gaps in public policy, including the following:

i) The unwillingness of resource planning to identify and take advantage of the full potential of the processing of raw materials.

ii) The lack of proper planning in transportation, as evidenced by the unavailability of proper transportation facilities and the existence of an irrational freight rate structure, to ensure that potential manufactured products could be cheaply transported to their destinations.

iii) The inadequate development of research and development in Canada to promote product innovation, to identify and facilitate the marketing potential of new industry products, and to develop and implement new cost-efficient technologies.

iv) The inability of manpower planning to anticipate and encourage the development of specific skills that are necessary for new manufacturing industry development.

These past shortcomings have not only limited the diversification of the manufacturing sector, but they have also restricted the full productivity and cost-efficiency potential of existing manufacturing activity.

c) Productivity Related Problems

Productivity is affected by both cyclical and structural factors. The cyclical pattern of productivity change for the economy as a whole is illustrated in Table 18. Productivity growth in each expansion exceeded productivity growth in any contraction since the early 1950's.

TABLE 18

Labour Productivity Growth During Economic Contractions and Expansions(1) - 1953-1977

(Average Quarterly Percentage Change in Gross National Product in Constant 1971 Dollars per Employee)

Contractions	
1953 Q_1 - 1954 Q_1	- 0.2
1956 Q_3 - 1961 Q_1	0.2
1966 Q_1 - 1970 Q_4	0.4
1974 Q_1 - 1977 Q_4	0.1
Expansions	
1954 Q_2 - 1956 Q_3	1.3
1961 Q_2 - 1966 Q_2	0.8
1970 Q_4 - 1974 Q_1	0.8

(1) The periods used in this table were taken from the Conference Board study, Perspective on the Canadian Economy: An Analysis of Cyclical Instability and Structural Change.

Source: Statistics Canada, National Income and Expenditure Accounts (Cat. No. 13-201)
Statistics Canada, The Labour Force (Cat. No. 71-001).

In terms of structural factors, there are a number of reasons for the existing productivity gap between the Canadian and U.S. manufacturing sectors. The relative importance of each factor will of course vary by industry. The following summary basically represents a synthesis of some of the more important productivity related problems:

i) Plant size in Canadian manufacturing industries, relative to industries in the

United States, is an important factor contributing to productivity differences between the two countries. As indicated in Table 19, among major industrial countries, Canada ranks low in terms of plant size - only slightly more than half the level in the United States. There is a clear relationship between plant size, wages and productivity. In 1974, for example, 61.8 per cent of all manufacturing establishments in Canada were small firms (those employing less than 20 employees) and they employed only 7 per cent of manufacturing production workers. These small firms produced only 5 per cent of total manufacturing value added. The lower productivity of small firms was reflected in earnings. The average earnings of production workers in small firms were 15 per cent below the average for manufacturing and a whopping 29 per cent less than those in firms employing more than 500.

ii) Distinct from the question of plant size is the question of length of production run. Even where plant size is comparable by international standards, Canadian costs are higher because plants are involved in multi-product activities rather than concentrated in one product. One source of higher costs is machinery "down-time" as alterations are required to switch from one product to another.

iii) The relatively low and declining levels of research and development in Canada, and especially in the manufacturing sector, have contributed to the productivity differences between Canada and the U.S. Table 20 shows that Canada has not only lagged behind in research and development by international standards but that Canada over time has placed a lower priority in this area. The most recent statistics indicate that research and development, as a percentage of Gross National Product, has fallen below one per cent. Especially discouraging, however, are the research and development trends in the manufacturing sector. As a percentage of the value of output, research and development expenditures in manufacturing declined from .80 per cent in 1965 to .58 per cent in 1975. These problems are compounded by the fact that most of the research and development has been concentrated in the adaptation and the limitation of foreign production processes and technologies, rather than in product, marketing and technology innovation.

iv) Skilled labour shortages have in some instances contributed to the productivity differences between Canadian and U.S. manufacturing industries. This is a problem even in a depressed economy like the current one. Indeed, even if conditions were generally favourable to an economic expansion, skilled labour shortages would be a serious "bottleneck" to taking advantage of such conditions.

v) The foreign ownership of much of the Canadian manufacturing sector has been responsible for some of the above productivity related problems. In the case of the scale of plant and the product rationalization problems, the unwillingness or inability of foreign owned firms to compete with their head offices and break into new foreign markets makes it difficult to deal with these problems. Moreover, foreign ownership tends to limit the amount of research and development in Canada, since most of it is performed in the home country.

TABLE 19

Index of Average Plant Size in Six Industrial Countries - 1967

	Average Plant Size Index (U.S. = 100)
West Germany	121
United Kingdom	111
United States	100
France	68
Sweden	61
Canada	57

Source: Economic Council of Canada, Looking Outward, 1975, p. 33.

TABLE 20

Research and Development and Basic Research Expenditures as a Percentage of Gross Domestic Product - International Comparisons

	Total Research and Development			Basic Research
	1967(1)	1970-73 (average)	1975	1970-73 (average)
Canada	1.5	1.1	1.0	0.1
United States	2.8	2.5	2.4	0.4
Germany	1.7	2.2	2.2	0.3
France	2.2	1.8	1.9	0.4
Japan	1.7	1.7	1.7	0.4
United Kingdom	n.a.	2.3	n.a.	0.2
Belgium	n.a.	1.5	n.a.	0.3
Netherlands	2.2	2.1	2.0	0.6
Sweden	1.3	1.5	1.6	n.a.

(1) as a percentage of Gross National Product.

Source: OECD

d) Trade Policy Related Problems

The importance of trade to the manufacturing sector, and in turn the importance of manufacturing trade to the economy as a whole, are clear from the basic statistics. In 1976, manufactured product exports amounted to $25.4 billion - two-thirds of all Canadian merchandise exports. Manufactured imports - at a level of $30.6 billion - amounted to four-fifths of all merchandise imports. Manufacturing industries differ to a great degree in terms of their reliance on trade. Some industries - such as foods and beverages or metal fabricating - are basically localized industries with little trade occurring. Some industries - particularly resource-based ones such as primary metals and paper products - are highly export-oriented, but import penetration is moderate. Some industries - such as textiles and electrical products - are the reverse, being subject to high levels of import penetration with a low degree of export orientation. Finally, some industries - such as machinery and transportation equipment - are characterized by a high degree of continental rationalization with the result that there is a high level of two-way trade.

Canada is currently participating in the re-negotiation of the General Agreement on Tariffs and Trade - the so-called "Tokyo Round". Given the "open" nature of the Canadian economy, Canada has more at stake in these negotiations in relative terms than most countries. The future of the manufacturing sector is particularly vulnerable to the outcome of these negotiations. At the present time Canadian tariffs on manufactured imports are high relative to those of other industrialized countries. On the other hand, the tariffs levied on our exports of raw materials are relatively low. The "working hypothesis" of the negotiations has been the so-called Swiss formula - an average 40 per cent reduction with the highest tariffs being reduced by more than the lowest tariffs. It is clear that if this formula were applied strictly, Canada would get a bad deal. The manufacturing industries would be particularly hard-hit with tariff reductions greater than the average 40 per cent. A recent study issued by the federal Department of Industry, Trade and Commerce has estimated that the Swiss formula would result in 48,000 fewer jobs in the manufacturing sector by 1990 than otherwise would have existed.*

In order to achieve true reciprocity in the negotiations, Canada must receive major concessions that go beyond the Swiss formula. The whole question of non-tariff barriers is crucial for Canada. While Canadian tariffs on manufactured products are relatively high,

* Industry, Trade and Commerce, "A Structural Analysis of the Canadian Economy to 1990", May 1978, p. 24.

Canada does not apply non-tariff barriers to trade to nearly the same degree as other countries. On an over-all basis, then - considering both tariff and non-tariff barriers - Canada's manufacturing sector is not more protected than in other countries.

An example of a non-tariff barrier of particular importance to Canadian manufacturing is the whole question of government procurement policies. This question is particularly important in some key individual sectors such as telecommunications and transportation equipment. Canadian industry has proved its effectiveness in thèse areas in terms of engineering, financing and service. But in several key markets - including Japan and Europe - Canadian sales are blocked because of government procurement policies that virtually reserve the market for domestic producers.

A second area where Canada must receive concessions that go beyond the simple application of the "Swiss formula" is on the whole question of what is referred to as the "tariff escalation" phenomenon. Canada is, to a large extent, currently locked into a trade pattern of exporting resources in raw form and importing end products because of the tendency for other countries to allow resource products in at a low tariff level but to escalate the tariff level the higher the degree of processing. If Canada is to be able to expand its processing of raw materials for ultimate export at the fabricated and fully manufactured stages, this escalation factor must be broken down. In the current negotiations, the non-ferrous metals and forest products have been chosen as particular cases for special concessions in this context.

The Canadian Labour Congress continues to support the policy of liberalized trade. But trade must be truly liberalized. Trade is not liberalized if Canada gives definite tariff concessions for an indefinite expression of intent by other countries to lower non-tariff barriers. Nor is trade liberalized if competitive advantages are gained on the basis of exploitive wages and working conditions.

Moreover, we completely reject the proposition that a freer trade policy is a substitute for a process of industrial planning. The idea that all that the manufacturing sector needs is the cold winds of exposure to foreign competition in order to "shape it up" reflects a "survival of the fittest" mentality that is unacceptable. A pre-condition to liberalized trade is a process of industrial planning geared to full-employment. While other "adjustment" programmes - training, mobility, etc. - are necessary, there is no substitute for full employment conditions to ease the transition to a freer trade environment.

III Policy Recommendations

A number of policy recommendations can be derived on the basis of the previous analysis of the causes of the problems in the manufacturing sector. Some of these policy recommendations affect the manufacturing sector in a general way while others are specific to a certain number of individual industries in these sectors.

1. Monetary and Fiscal Policy

There exists a clear need to quickly expand the rate of growth of total demand in the Canadian economy in order to strengthen existing manufacturing industries. A drastic reversal in the direction of monetary and fiscal policies is therefore required.

In the case of fiscal policy, the March 1977 budget again provided clear proof that corporate and investor tax concessions will not increase the growth of investment and demand, especially under conditions where the rates of existing capacity utilization are very low. The only positive effect of these March 1977 corporate and investor tax cuts has been to convince even the federal government that it is necessary to increase demand in a more direct manner. However, the recent federal government attempts to do this have unfortunately been meagre to say the least. In November 1977, the mini-budget reduced personal income taxes by roughly $700 million. Taken together with the indexation of personal tax rates, the apparent effect was a stimulus of roughly $2 billion to the economy. However, as the Canadian Labour Congress pointed out at that time, the net effect of the mini-budget was in fact quite negligible because this apparent $2 billion stimulus was largely offset by the tightening of the third year wage control guidelines to 6 per cent from 8 per cent. The latter move reduced the potential level of wages and salaries by roughly $2 billion. Similarly, in April 1978 the federal budget introduced the provincial sales tax cut proposal which was supposed to inject $1.1 billion into the economy. However, when associated actions are taken into account - reductions in federal government expenditure and increases in other provincial taxes - the net stimulus turned out to be roughly $300 million.

Instead of corporate and investor tax concessions, meaningful expansionary policies are required. Specifically, sizeable reductions in personal taxes for middle and lower income groups are required. Moreover, government expenditure should be increased through more generous benefits for the elderly. In addition, there is a need for an increase in productive government investments. As we shall see later in this section, the potential areas of useful and productive investments are quite large. These public investments could take the form of productive social investments, such as in affordable housing, and/or in industrial-related investments. Contrary to recent government arguments, these government expenditures need not be inflationary. On the contrary, given that they would increase the supply of necessary goods or services, they would contribute to restraining inflationary pressures in specific sectors.

The initial impact of these budgetary proposals would obviously be to increase the size of the federal deficit in the short term. This in itself is not undesirable under the current conditions of slow growth and high unemployment, especially since the net provincial budgetary position was one of a surplus in 1977. However, this increase in the federal budgetary deficit could be moderated by the repeal of the more than $1 billion in corporate and investor tax concessions that were granted in March 1977 and April 1978. Moreover, over the next couple of years, the budgetary deficit would be reduced significantly as a result of the subsequent growth in incomes, which will increase tax revenues, and by the reduction in unemployment, which would reduce unemployment insurance and related expenditures. The increased tax revenues effect is the more important one because it is very clear that the recent increases in the federal budgetary deficit have been the result of a marked slowdown in revenue growth.

There also is a need for a drastic reversal in the direction of monetary policy. The recent restrictive monetary policies which have resulted in high interest rates must be reversed. Lower rates of interest are necessary to promote investment growth and especially consumption growth. Obviously, one of the reasons that the federal government has kept interest rates high has been to attract foreign capital into Canada and support the ailing Canadian dollar. However, such an approach to dealing with our balance of international payments problems is a very short-sighted and costly alternative that does not guarantee any definite longer term results.

A final point which must be made, in the area of monetary and fiscal policy, concerns the recent concept of "the narrow band" or "the narrow path" which has been used to justify monetary and fiscal policies of "moderate" growth. The argument is that we cannot expand the economy as fast as we have in the past because it would result in rising rates of inflation. However, it is not clear why this should be the case in the current period, as distinct from the past. The rapid inflation of a few years ago was largely the aftermath of special factors such as OPEC price increases which are unlikely to be repeated. Moreover, there is now a considerably higher degree of slack in the economy, so that there is considerably more room for expansionary policies to be pursued before inflation becomes a threat. Indeed, an expansionary economy with full-employment conditions is the most effective anti-inflationary policy possible.

2. Policies Related to the Diversification of the Manufacturing Sector

Based on the analysis of the causes of the problems in the manufacturing sector, there is a clear need to diversify the manufacturing sector. This diversification can take two forms. It can mean an increase in the range and/or degree of processing of raw materials into fabricated materials. It can also take the form of new industries producing fully manufactured goods.

The successful diversification of the manufacturing sector is contingent on three important conditions. First, there must be a greater concern on the part of both government and the private sector to identify new investment opportunities in the manufacturing sector. The 22 sector meetings represented some potential in this area, within the context of the private sector. However, the major responsibility in this area lies with the government. The need to identify new investment opportunities necessarily implies a greater degree of industrial planning on a national basis. The specific role for government is discussed in the next section.

Second, the necessary infrastructure investments must be undertaken to ensure that these opportunities become viable alternatives. These infrastructure investments are related to areas such as research and development, transportation, energy and manpower planning. The necessary policy changes in these areas will be specifically outlined below in the section on productivity related policies because they also greatly affect existing manufacturing industry.

The final condition in the successful diversification of the manufacturing sector is the assurance that these new investment or industry opportunities will actually be undertaken either by the private or public sector. This assurance can only be realized if certain important institutional changes are made that allow for the planning or co-ordination of major private and public investments. These necessary institutional changes are outlined in Section IV. A related issue here is the ability to get foreign corporations to widen the range and degree of the processing of raw materials in Canada. One practical alternative is to use the Foreign Investment Review Agency (FIRA) to impose more stringent conditions on foreign investment destined for the resource sector. FIRA should also be expanded to cover the existing foreign-owned resource companies and, in conjunction with other relevant public agencies, it should make land leasing renewals conditional on a greater degree of processing.

3. Productivity Related Policies

In our earlier analysis of the productivity question, we concluded that productivity could be increased both in a cyclical and in a structural or longer-term sense. In the case of cyclical productivity growth, the reversal in the direction of monetary and fiscal policy to increase the growth in demand is the most relevant policy recommendation. In the case of structural or longer-term productivity growth, policy changes are needed in a number of important areas.

a) Industry and Product Rationalization Policies

Although the lack of adequate industry and product rationalization represents a serious barrier to long-term increases in the growth of productivity, we realize that it is difficult to deal with this problem in terms of positive policies. Most of the past policy changes in this area have not been effective. For example, the proposed merger and specialization agreement policies in the Competition Act facilitate rationalization, but do nothing to actively encourage rationalization. Another example is the suggestion that

tariff and non-tariff reductions will force rationalization. However, as discussed earlier, there are serious problems in some of the assumptions underlying this argument.

One positive policy recommendation in this area would be to increase the flow of information concerning the benefits of rationalization, especially in the context of past cases that have been successful. A second possibility would be the use of the Foreign Investment Review Agency to more efficiently screen prospective foreign investments against the criterion of contributing to a rationalization process. Finally, some thought should be given to possible mechanisms (for example, punitive tax measures) that will result in a greater export effort or in some form of international product rationalization by foreign-owned firms in Canada which currently are not allowed to compete with their parent corporations.

b) Research and Development Policies

Structural or longer-term productivity growth could be improved by an increase in the relative share of resources going to research and development. There is not much use in recommending a specific percentage of Gross National Product that should go to research and development. What is important is that the past declining trends be reversed and that the policy makers remain sensitive to the international comparisons. Furthermore, an increased share of total research and development should be directed to the manufacturing sector. These funds should also be directed to improving product and technological innovation and marketing techniques and potential. They should not be used primarily for the purposes of adapting and/or imitating existing processes, technologies and/or products.

The policy mechanisms that should be used to increase the extent and range of research and development in Canada are also important. Where the research and development is to be done in the private sector through government incentives (such as the recently announced federal programme), it is important that a proper or effective monitoring mechanism be put in place. Such a monitoring mechanism should verify that the public funds are used to support new research and development and that they are not being used simply to finance activity that would have taken place anyway. If there is no such safeguard, we might find that the level of research and development has not changed substantially while the pattern of financing (private vs. public funds) has. Moreover, some policy mechanism must also be developed to monitor the nature of the research and development to ensure that the past poor record in product, marketing and technological innovation is reversed. As with other types of incentive programmes, the acquiring of an equity position by government in return for R & D subsidies can be used where appropriate.

However, the responsibility for research and development should not be left solely with private industry. The government, either directly or through various research oriented institutions, must get more involved in research and development. There are a number of benefits to such an alternative. The government can co-ordinate the research and development expenditures to meet the needs of an industrial planning programme. The government can also affect the timing and to some extent the regional location of these expenditures. These investments can also be very profitable since they represent a potentially marketable service. Finally, by undertaking some of the research and development expenditures itself, the government has a greater control over whether the resulting innovations will be used in Canada or whether they will be sold abroad.

The Foreign Investment Review Agency should also be used much more extensively to screen the research and development content of prospective new foreign investments. Moreover, some thought should be given to possible policy mechanisms that would result in the existing foreign-owned manufacturing firms doing more research and development in Canada.

c) Manpower Policy

The essential purpose of a manpower policy is to provide a match between the skill requirements of jobs and the availability of skills among the labour force. Basically, Canada does not have a manpower policy despite the existence of a multiplicity of manpower programmes. One reason for the absence of a manpower policy is of course the existence of divided jurisdictions among governments. In Canada, a balkanization has occurred in that the provinces have responsibility for "education" and the federal government has responsibility for "manpower". In reality, the distinction between "education" and "manpower" is not sustainable, so that this whole area is one of

continuing federal-provincial wrangling. A case in point is the pre-skill training programme operated by the federal government entitled Basic Training for Skill Development. Despite the title - which was chosen to acknowledge the constitutional division of responsibility between the federal and provincial governments - it is really an "education" programme concentrating on basic academic skills required prior to entry into an occupational training programme. The BTSD programme is largely oriented to drop-outs from the educational system. The federal government has recently adopted the position that this programme is a response to the failure of the provincial education system and should not really be a federal responsibility. While arguing the constitutional niceties, the federal government's real motive is expenditure control. The general point illustrated by this example is that the constitutional division of responsibility in Canada severely inhibits the development of an effective manpower policy.

An even more fundamental reason for the lack of a manpower policy is that such a policy must follow from an industrial strategy. Without an industrial strategy, manpower planning is not planning at all, but groping in the dark. The lack of a manpower strategy as an intrinsic part of an industrial strategy has resulted in very serious imbalances at the present time. On the one hand, we have the phenomenon of highly educated (but not necessarily highly skilled) individuals taking jobs that do not require such qualifications. In a period of high unemployment particularly, academic qualifications are used to ration jobs - in other words, these qualifications are needed to get jobs, not to perform jobs. On the other hand, along with a very high level of both unemployment and under-employment, an increasingly serious problem of skilled labour shortages is developing in Canada, particularly in relation to specific industries such as machinery, urban transportation equipment and aerospace. The future health of the manufacturing sector is severely clouded by the shortage of skilled labour - particularly in that the most promising sectors of manufacturing on other grounds are particularly vulnerable to skilled manpower shortages. Canada is now paying the price of an elitist attitude which has exalted academic education and has denigrated the trades.

Nothing short of a drastic change at each stage of the education-training system is required to make it more relevant in an industrial context: at the primary-secondary school level; community college level; the system of on-the-job training; and paid educational leave for workers.

In terms of the supply of skilled tradesmen specifically, the following measures are recommended:

a) In general, we need a co-ordinated national manpower training investment policy that will train Canadian youth and adults and produce an adequate supply of skilled tradesmen.

b) This programme should involve federal and provincial governments, the education institutions, labour and management.

c) All manufacturing industry trades, such as tool and die makers, machinists, fitters, maintenance trades, instrument mechanics, electronic technicians, etc., should be designated as apprenticed trades. The standards for each trade should be uniform in each province so that a journeyman in one province is recognized as such throughout Canada.

d) The government should maintain an inventory of employees in the skilled trades - the number in each trade by age groups. Industry should provide five-year manpower forecasts so there can be better planning of our manpower training programmes.

e) The government should pay for moving allowances and short-term rental allowances to encourage moving to suitable jobs.

f) A special fund should be established for skilled trades training into which manufacturing companies would contribute a payroll tax. Apprenticeship training costs should be paid from this fund to employers who establish and operate a recognized apprenticeship training programme as well as for a recognized retraining and upgrading programme when new technology is introduced in the plant.

4. Cost-Related Policies

Based on the earlier evidence presented in this paper that the manufacturing sector has not suffered a structural decline in profitability and is not in general uncompetitive internationally, we believe that the emphasis of policy discussions should be shifted away from wage restraint, corporate and investor tax cuts and reductions in government regulations and social programmes.

We are opposed to both wage controls in general, and to the control of public sector wages (Bill C-28) specifically. The evidence presented earlier showed that there is no basis for general wage controls. Moreover, the argument that suggests that public sector wage levels are a problem is not convincing. It completely ignores the fact that public sector wage increases in the immediate pre-controls period merely served to eliminate some of the inequities in wage structures that existed in the past. Wage controls have had and will continue to have an adverse economic effect by effectively restricting the rate of growth in consumption and investment.

The evidence again shows that there is no need for general use of corporate and investor tax concessions. If individual industries need assistance, this could be provided through specific subsidies which could be administered by the relevant government agencies. This conclusion has some important implications for a number of recent tax related policy recommendations. One of these recommendations is for changes in the tax structure to take account of the fact that some corporate costs in an inflationary period are underestimated by current accounting techniques - e.g., the replacement costs of machinery and inventory. However, the other side of the coin is not often discussed - for example, when inflation is 10 per cent and corporations sell bonds for 8 per cent, their real costs of borrowing are negative. A recent study for the Economic Council of Canada concluded:

> "After 1972, the gain which business has received by paying a lower compensation for inflation on their short-term financial liabilities than that actually experienced has increased dramatically. In 1972, the owners of manufacturing enterprises received a transfer of approximately $24 million and non-manufacturing $5.2 million. By 1974, this had risen to $200 million and $337 million, respectively. The inflationary transfer received by the financial sector on their short-term financial position has been substantial. In 1965, this transfer was valued at approximately $390 million, but by 1973 it had more than tripled to a value of approximately $1300 million.
>
> Manufacturing and non-manufacturing corporations have also received a net income transfer from the holders of their net long-term liabilities for every year since 1965. This transfer has grown for manufacturing from $81 million in 1965 to over $560 million by 1974, and for non-manufacturing from $180 million to $894 million."*

We also vehemently disagree with proposals to substantially reduce social programmes, such as unemployment insurance and minimum wages, and government regulations. There are some very important social costs that would accompany such reductions. In the case of unemployment insurance benefits, it would be highly irresponsible to further tighten the benefits and eligibility requirements especially in view of the severity of the current unemployment conditions. The latest vacancy statistics show that there are only three jobs available for every 100 unemployed. We should also add that a reduction in unemployment insurance benefits would adversely affect demand and therefore production, investment and employment.

The reduction or elimination of the minimum wage would also be irresponsible since it would result in government abdicating its responsibility to provide a minimum standard of living. As in the case of the unemployment insurance benefit levels, the minimum wage is already low in terms of what is required to live decently.

In the case of government regulations, we would agree with attempts to make such regulations more cost efficient. One example of where this is possible is in information gathering or reporting requirements. However, we would disagree with the general principle of reducing government regulations and allowing private industry to impose its own standards of social responsibility. It should be kept in mind that these regulations were first imposed because there existed a need for such regulations and there is no evidence that the need has diminished. We should also add that in the case of government regulations,

as well as in the case of various social programmes, we strongly object to the proposal that cost-benefit analyses be performed to judge the net impact of such measures. The cost-benefit technique is extremely arbitrary and it is also biased in this application since the costs, measured in dollar terms, are more easily measured than the benefits, which are measured in social and individual terms. As an alternative to these areas, cost-reduction policies should be directed at costs such as energy and transportation costs which not only have affected existing industries but have also inhibited the development of new ones.

5. Trade Related Policies

The following set of guidelines and recommendations for the conduct of trade policy particularly in relation to GATT were approved as Congress policy at the 1978 CLC Convention:

- We support continued efforts to achieve a more rational trade agreement through the process of multilateral trade negotiations under GATT. Trade liberalization must be reciprocal and must take place both in terms of tariff and non-tariff barriers.

- Freer trade is a myth if competitive advantages are gained not on the basis of fair competition and superior technology, but on the basis of unfair labour practices. Canadian industries which are technologically on a par by world standards, but which are threatened by imports from labour-exploitive or state-trading countries, must be preserved through non-tariff barriers.

- Canada must implement an industrial strategy geared towards full employment, with the direct input of labour, before Canadian workers can hope to reap the benefits of trade liberalization.

- The whole focus of the trade negotiations should be on jobs - the human dimension - rather than simply goods, for what is at stake is not only the international exchange of goods, but the exchange of jobs. In order to ensure this focus, labour should have a direct input into trade negotiations, with an advisory status, as well as access to crucial information to assess the likely impact on Canadian jobs.

- In order to prevent the costs of structural changes following liberalized trade to fall disproportionately on some workers and some regions, a flexible and comprehensive trade adjustment assistance programme must be developed with labour input, which would include a programme of full maintenance of earnings in relation to the average industrial wage for affected workers.

- The industrial and trade negotiations strategy must seek to diminish the relative importance of raw materials in our exports, and encourage the growth of both processing and fabricating industries in Canada.

- In order to guarantee real achievement in the reduction of non-tariff barriers, there must be an effective mechanism developed for national and international documentation, surveillance and the settlement of disputes.

- Effective bargaining and legislative measures must be enacted to offset the monopolistic practices of multinational corporations in international trade.

- Article XIX of GATT dealing with safeguards should be altered to allow its selective application without time limits to countries whose products are causing injury to domestic industries, rather than indiscriminately to all countries as currently written. Moreover, the article should be re-phrased to emphasize that the criteria for determining injury are the position of workers and jobs rather than another criterion such as profits.

IV The Role of Government

There are important implications for the role of government in dealing with the problems in the manufacturing sector. A fundamental issue concerns the policy methods or mechanisms that the government is willing to use to deal with the causes of the problems in the economy and in the manufacturing sector specifically. Even if a consensus does exist on the causes of the problems in the manufacturing sector, the question of how these problems will be dealt with still remains.

In several instances in this report, we have made it clear that we do not accept the approach that says that the sole, or even primary, role of government is to facilitate adjustments through incentives of various forms where these adjustments are initiated by private industry. One example of such incentives was the use of general tax incentives such as corporate and investor tax concessions, fast write-offs and inventory valuation adjustments in the hope that these would increase investment and demand in general. A second example was the amending of the Competition Act to facilitate mergers and specialization agreements in the hope that this would lead to greater rationalization and higher productivity in the manufacturing sector.

A sole reliance on incentive based policy mechanisms will not ensure that the necessary decisions will be taken by the private sector to deal with the causes of the problems in the manufacturing sector. The current situation in the economy and in the manufacturing sector specifically, is evidence of the fact that these incentive methods have not been effective in the past in increasing investment and employment, when and where it was needed, and in increasing productivity and lowering costs of production.

Instead of relying solely or primarily on incentive based policy methods, the government must play a much more active or direct role in co-ordinating or planning investment and manpower decisions. This national industrial strategy would serve several objectives in the case of the manufacturing sector, specifically:

i) it would have to deal with the timing of investment and demand in order to even out the business cycle and ensure that a more favourable economic climate for balanced growth exists;

ii) it would have to contribute to identifying new investment opportunities in the manufacturing sector in order to contribute to a greater diversification of this sector. It would also have to co-ordinate private investment decisions and/or use public investments to take advantage of these new opportunities;

iii) it would have to contribute to identifying investment opportunities that would increase efficiency and lower costs in the manufacturing sector. Again, it would also have to co-ordinate private investments and/or use public investments to take advantage of these opportunities; and,

iv) when this type of investment planning is in place, it could effectively administer manpower policies to ensure that qualified workers are available to take on the employment opportunities. Manpower policies could only be effective if there exists adequate foresight of when and where jobs will be available and what skills or education these jobs will require.

This more active or direct role for government in industrial planning can be translated into several practical policy mechanisms. These policy mechanisms would however necessitate certain institutional changes. We can outline these policy mechanisms, in turn:

i) legislation to set up some type of investment fund that will plan or co-ordinate major private and public investments. This fund could be used to even out the timing and the regional pattern of investment. It could also be used to make the necessary investments to increase productivity in the manufacturing sector and diversity in the manufacturing sector. The investment fund could be financed from pension funds and from a certain percentage of general government revenues. Another possible source of funds could be corporate profits. For example, a certain percentage of corporate profits, during an expansionary period, could be "locked in" to the investment fund to be used by the corporation during periods of lower economic activity, in regions of lower manufacturing investment; and/or in activities that would increase productivity in the manufacturing sector or diversify the manufacturing sector. We should add that large corporations from all sectors of the economy (and not just manufacturing) would participate in this investment fund. This arrangement would have the benefit of promoting a greater degree of processing of our natural resources by the corporations in the resource sector;

ii) the use of existing crown corporations and/or the establishment of new ones (if they are needed in the manufacturing sector) to carry out necessary investment decisions when and where private industry is unwilling to invest. Such public

institutions are well within Canadian tradition and experience. However, these public enterprises should not be limited to the takeovers of faltering private enterprises and/or other high cost and high risk activities. They should also enter into lucrative activities as well. There will be cases where private corporations will not invest because the private rate of return will be lower than what could be earned in alternative investments. However, public enterprises can operate not on the basis of this private rate of return but on the basis of the social rate of return, which includes such revenues as the savings from reduced unemployment insurance payments and the increased tax benefits from greater employment and growth. Special emphasis should also be placed on resource sector crown corporations, such as Petro Can, to ensure that they enter into processing activities to a much greater extent than in the past; and,

iii) the use of joint public-private ventures as an instrument to influence the planning of investment decisions. Again, such ventures are well within Canadian experience and tradition. They similarly benefit from the fact that they can operate on the basis of social costs.

We should also point out that a favourable economic reaction from private industry is in effect contingent upon effective government action. As investment, productivity and growth increase as a result of government action, private industry (whether they agree or disagree with such action) will see the possibility for future profits and will themselves expand output and investment. This will lead to further increases in productivity and growth in the economy and in the manufacturing sector specifically. It is the expectation of a future strength in demand and in a flow of returns on investment, and not a one-shot general increase in incentives, that will lay the groundwork for economic growth and a strong diversified manufacturing sector.

To this point, we have taken a strong position against general incentive based policy mechanisms. We must qualify this position by adding that in a number of individual industries additional tax incentives or subsidies of some form might be necessary to make the industry viable. However, it is important to point out that these incentives should not be made generally available to all industries. Moreover, as we discussed in the section on policy recommendations, they should be screened for their effectiveness in creating employment and/or promoting investment and exports. As an option to ensure the proper use of these specific tax incentives or subsidies, the government could offer these in the form of equity participation by government in the enterprise. Such participation would also be useful in co-ordinating or planning the future investments of these enterprises.

ANNEX C-2

COMMENTS OF THE AEROSPACE MANUFACTURING SECTOR CONSULTATIVE TASK FORCE ON THE LABOUR REPORT TO THE CO-ORDINATING COMMITTEE FOR THE 23 INDUSTRY SECTOR TASK FORCES

INTRODUCTION

The Labour Report to the Co-ordinating Committee for the 23 Industry Sector Task Forces (reproduced as Annex C-1) was tabled at the Fifth Meeting of the Aerospace Manufacturing Sector Consultative Task Force held on July 24, 1978. The labour members on the Task Force, Messrs. M. Rygus and J. Gill each identified the report in their respective minority reports as a statement of their general position on comprehensive issues and on those issues relevant to the aerospace manufacturing sector.

SECTIONS I and II The Importance of the Manufacturing Sector and An Analysis of the Problems in the Sector

The Task Force recorded no comments on the data or its interpretation. It was assumed that the data will be fully considered by the Co-ordinating Committee for the 23 Task Forces.

SECTION III Policy Recommendations

1. Monetary and Fiscal Policy

Comment by the Aerospace Task Force was considered inappropriate since it had concentrated on policy recommendations specific to the development of the aerospace manufacturing sector.

2. Policies Related to the Diversification of the Manufacturing Sector

The Task Force considered that the recommended policies did not apply to the Aerospace Manufacturing Sector.

3. Productivity Related Policies

There was general agreement with the intent of the recommended policies to secure an improvement in productivity. The Task Force noted that it had already endorsed the need for productivity improvement measures and that the member companies of the Air Industries Association of Canada had a very active program for productivity improvement in place.

At 3(a) the imprecise definition of "rationalization" caused difficulty. The majority of members supported concepts of consortia approaches and specialization but did not endorse the concept and examples of forcing mergers which appeared to be advocated in the labour report.

The Task Force supported the recommendations in 3(b) for an increased share of national resources going to research and development in the interest of stimulating productive growth. There was disagreement by the industry and government members with the recommendation that the federal government either directly or through various research oriented institutions must get more involved in research and development. The general view was that the federal government should not undertake research and development except that which could not be undertaken by the industry or universities, e.g. where large centrally-located, government owned, wind tunnel facilities must be used.

The policy recommendations in 3(c) on Manpower Policy, although noted as controversial in certain areas such as the recommendation for a payroll tax, found general support.

4. Cost Related Policies

The Task Force considered that the policy recommendations on Cost Related Policies were not directly relevant to its terms of reference.

5. Trade Related Policies

The recommendations were endorsed.

SECTION IV THE GOVERNMENT ROLE

The non-labour members disagreed with the labour recommendations on the role of government.

ANNEX D

ACKNOWLEDGEMENTS

As Chairman of the Aerospace Manufacturing Sector Consultative Task Force, I wish to thank the members for their wholehearted participation in the studies and discussions from which our recommendations were derived.

I also wish to thank the many people who provided resource assistance to the Task Force. In particular, I record my appreciation of the co-operation and assistance rendered to the Task Force by Mr. M. Brennan, Director General of the Transportation Industries Branch, Federal Department of Industry, Trade and Commerce in his role as Executive Secretary and by his staff.

D.C. Lowe
Chairman

SECTOR PROFILE

CANADIAN AEROSPACE MANUFACTURING INDUSTRY

The following profile of the Canadian Aerospace Industry was developed by the Sector Task Force on the Canadian Aerospace Industry from a profile prepared by the federal Department of Industry, Trade and Commerce.

THE INDUSTRY IN PERSPECTIVE

The Canadian aerospace manufacturing industry has specialized capabilities for the design, research and development, production, marketing and in-plant repair and overhaul* of aircraft, aero-engines, aircraft and engine sub-systems and components, space related equipment and air and ground based avionic systems and components**.

Approximately 100 companies are engaged in significant manufacturing work. Forty companies accounted for 90 per cent of the industry's sales of $800 million in 1976. The employment in 1976 was 25,300. Nine major companies accounted for 60 per cent of total sales. They were:

— Canadair Limited (CL Montréal), the de Havilland Aircraft of Canada (DHC, Toronto) and the Douglas Aircraft Company of Canada (DACAN, Toronto) in airframe and parts;

— Pratt and Whitney of Canada (PWC, Montréal), in aero-engines and parts;

— SPAR Aerospace (SPAR, Toronto) and Bristol Aerospace (Winnipeg), in space related products, airframe components and repair and overhaul;

— Litton Systems (Toronto), Computing Devices (Ottawa) and CAE Electronics (Montréal) in avionics.

It is economically impractical for Canadian industry to fulfill all the diverse aerospace product needs of the Canadian market. Through selective specialization, the Canadian industry has developed product lines in areas related to Canadian capabilities and export market penetration. Seventy-five to 80 per cent of its sales are in export markets (Annex A), most of which are obtained under strong competitive conditions. Countering this is an inflow of goods and services used in the manufacture of Canadian aerospace products and by Canadian air operations. On the manufacturing account (i.e. excluding the imports to air operations) there has been a net industrial trade balance, in favour of Canada, of $428 million in 1976 and $379 million in 1975. The corresponding overall trade balance (i.e. including imports to air operations) is estimated at $178 million surplus for 1976 and $88 million deficit for 1975.

In 1976, Canada's aerospace manufacturing industry shared fifth place at $.8 billion, in Western world sales with Japan. The four leaders were U.S. at $24.5 billion, France at $4.1 billion, Britain at $3.4 billion and West Germany at $1.5 billion.

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*There are two classifications of repair and overhaul, in-plant R&O (statistics of which are included in this sector profile) and R&O performed by the carriers and operators (aerospace components imported for R&O by operators and carriers are included in import statistics but the value of their services is excluded).

**Avionics activities are covered in the Electronics Sector Profile since the technology is integral to most electronics industry operations. This profile includes broad avionics statistics as a comparative guide to the significance of the activity to other aerospace activities only. Space related activities are influenced by a space industry policy developed and administered by the Department of Communications.

In terms of Canadian exports of transportation equipment, the industry ranks second after motor vehicles and vehicle parts and accessories (See Annex B). In terms of advanced technology manufactured equipment, the aerospace industry is Canada's leading exporter.

The major trading partner is the United States which in 1976 accounted for about 60 per cent ($370 million) of the Canadian exports and about 90 per cent ($170 million) of the imports used in Canadian aerospace manufacturing.

The industry has evolved as a significant contributor to Canadian economic, defence, social and international objectives through the following:

— The economic impact of domestic requirements for a broad range of foreign supplied aerospace products is balanced by the industry's strong export orientation (e.g. small engines, utility aircraft and parts).

— The industry provides employment for more than 25,000 with a characteristically high technological content.

— Due to the greater ease of obtaining offsets within the same industry type, the industry's capability is advantageous during government negotiations of aircraft procurement offset agreements (this is especially so for military aircraft procurement in the U.S. under the U.S./Canada Defence Production Sharing Agreement).

— The industry provides a means of gaining access to new foreign technology through technology transfer in addition to that which is self-generated. Spin-off benefits accrue to other Canadian industries through subsequent technology transfer and through the process of employment diffusion.

— The industry provides a repair and overhaul capability which supports the world's second largest fleet of commercial and private aircraft.

— The industry manufactures a line of utility aircraft consistent with the demands of the Canadian environment.

— The industry is technologically capable of providing certain specialized products and systems, some under licence, for military aircraft and related support for the Canadian Armed Forces, relatively independent of foreign industry during times of international crisis.

— The fact that Canada has an aerospace industry is advantageous to Canadian participation in international organizations and agreements such as NATO, NORAD, etc.

— The industry provides a source of aerospace products suited to the requirements of developing countries.

— The industry is capable of participating in a variety of international aerospace joint ventures due to its technological base ranging from design to product support.

There is a growing co-operation between government and the Canadian aerospace manufacturing industry. This is a world characteristic which arises from:

— the worldwide dependence of aerospace industries on government support due to the characteristically long lead times and related long pay-back periods associated with production of aerospace products;

— the use of national aerospace industries by their respective governments as tools of international commercial policy;

— the international interdependence associated with the successful manufacture and operation of aircraft whereby the industry finds itself as a key component of international agreements concerning technology exchanges, procurement offsets, joint ventures and co-operation in defence related activities;

— the strong regulatory framework administered by governments and government agencies for certification and operation of aircraft, mainly on the grounds of public safety;

— the internationally recognized strategic and economic importance of the industry's products and services to defence and air transportation respectively;

— considerations of national security.

In the last decade, the Canadian industry has undergone a gradual conversion from an inward-looking supplier of military products to a primarily export-oriented industry producing largely commercial products and (in selected products) is competitive in the international marketplace. It has survived the worldwide slow-down in commercial and defence aerospace markets associated with economic recession, and is in a much leaner state than its peak year of 1967. There is now good potential to reverse a decline since 1967 in sales (deflated) and employment (Annex A), due to: the stimulus of Aurora LRPA and new fighter aircraft industrial benefits (NFA); the initial success of the

Challenger aircraft program; a hoped for marketing breakthrough for the DASH 7 aircraft; an increasing demand for the Pratt & Whitney Canada jet engines; and an expected resurgence in markets for systems and components for U.S. large commercial aircraft.

The export-oriented industry is, however, now fully exposed to the competitive forces of the international aerospace market. The Canadian aerospace industry's hourly rates have in some cases surpassed the corresponding U.S. hourly rates. However, the recent devaluation of the Canadian dollar may mitigate this effect. The Canadian industry's export market penetration is becoming increasingly vulnerable to the economic forces associated with competitors' industrial productivity improvements. The industry is also afflicted, like most world aerospace industries, with financial problems implicit in manufacturing high cost, high risk products. There is a long-term pay-back cycle and products are subject to the vagaries of sporadic government purchasing decisions, tariff and non-tariff barriers, monetary inflation and rapid technological obsolescence.

Not surprisingly, the investment community can usually find less risky uses for its funds. As a result, the Canadian government has found it necessary to provide assistance to the industry to reduce the financial risks to more reasonable commercial proportions or face the demise of its aerospace industry. Continuing government support in one form or another is seen as an underlying necessity to the achievement of industrial stability. Government strategy is to provide financial support and services, primarily through innovative programs administered by the Department of Industry, Trade and Commerce (ITC), to sustain a viable share of the following interdependent market sectors:

— systems and components for United States commercial and defence aerospace products;
— proprietary Canadian end products and services, such as STOL aircraft, small aero-engines and factory repair and overhaul services, which can satisfy both export and domestic aerospace requirements in commercial and defence areas;
— derivatives of aerospace products, capabilities and services for other transportation markets (such as Canadair's role as systems manager and prime contractor for the Ontario Intermediate Capacity Transit System, and gas turbine powered pumping stations for oil and gas pipelines).

The government is also concerned with the maintenace of the industry's capabilities to undertake industrial benefit opportunities associated with major national defence and commercial carrier procurements.

INDUSTRY STRUCTURE

The Industrial Hierarchy

The companies comprising the Canadian aerospace manufacturing industry can be regarded as in three tiers in terms of capabilities and products. In the first tier are companies with an integrated capability to design, develop, manufacture and market complete aircraft and aero-engines. The second tier companies can manufacture aircraft, space and aero-engine sub-systems and some include a design and development capability. The third tier manufacturing companies are generally small businesses providing machining, sheet metal, casting, heat treatment, plating and other services, many of which are also engaged in non-aerospace activities.

It is important to understand that the three tiers of companies do not comprise a mutually supporting and self-sufficient Canadian hierarchy although the industry has a wide range of specialist products and skills. The industrial hierarchy to which the Canadian companies belong is mainly a North American aerospace industrial hierarchy centred on the U.S. industry, particularly in regard to the second and third tier companies. Thus, for example, a second tier manufacturer of landing gears may supply a Canadian first tier (prime) aircraft manufacturer but must also penetrate the market with United States prime contractors to be viable. Even the small machining jobbing shops are unlikely to be viable unless they can supply both the United States and Canadian first and second tier companies.

The interdependence between the Canadian and United States companies has evolved as a consequence of the Canada/U.S. Defence Production Sharing Agreement and the recognition that Canada can be self-sufficient in supplying only a specialist and small proportion of its aircraft needs.

First Tier (Prime) Companies

In the first tier are two aircraft companies and one aero-engine company.

Companies	*Products*	*Employment December, 1977*	*Location*
de Havilland (DHC) (government owned)	Aircraft	3,633	Downsview, Ontario
Canadair (CL) (government owned)	Aircraft Airframe and components Drones Urban transit	3,530	Cartierville, Montréal
Pratt & Whitney (PWC) (owned by P&W UTC US)	Small prop/shaft jet and fan jet aero-engines R&O piston engines	5,404	Longueuil, Québec

— *de Havilland* Since 1947, de Havilland has successfully marketed a family of STOL utility aircraft of its own design and manufacture. The Twin Otter has found worldwide acceptance as a short haul commuter airliner with more than 500 of these aircraft delivered to date. The company has also produced about 70 Buffalo STOL aircraft for military purchasers. The latest aircraft, the DASH 7, was designed as an economical and quiet commuter oriented transport with hoped for sales of up to 250. Sales have been disappointingly slow to develop.

— *Canadair* The company has supplied the Canadian Armed Forces with aircraft through a range of licensed manufacturing programs and company-designed products. In all cases, each military aircraft program resulted in additional export orders. The company has been a leader in the design and development of airborne battlefield surveillance drone systems since 1967. The West German government has contracted for a major drone development program with Canadair as prime contractor. The Canadair Water Bomber, designed for forest protection, has had limited success both domestically and in foreign countries due to relatively high costs of ownership and operation and restricted scope of its usefulness. In addition to manufacturing complete airplanes or systems, for the past 15 years the company has been a major supplier of airframe components to American and European prime contractors in both the military and commercial field. Although defence related activities are currently leading sales, a new business jet aircraft, the Challenger, will be the lead product in the 1980s. The current firm backlog on this new program is more than $500 million with deliveries scheduled from 1979 to 1981. Because of its systems engineering capability, in 1976 Canadair was selected by the Ontario government as the development contractor for an intermediate capacity transit system, a planned breakthrough in the field of urban transportation.

— *Pratt and Whitney Aircraft of Canada* (PWC) A 96 per cent owned subsidiary of United Technologies Corp., U.S. was until 1959 engaged primarily as a licencee for Pratt and Whitney (U.S.) piston engines. In 1959 the company, with Canadian government support, commenced the design and development of a series of proprietary small aircraft gas turbine engines. The first of the products, was the PT6 turbo-propeller engine and more than 12,000 have been delivered. The JT15D turbofan was introduced later, providing a successful entry into advanced aircraft propulsion technology. The gas turbine engine sales are contributing an expanding portion of total sales. With a recent increase in demand for its products, PWC has emerged as the major force in the Canadian aerospace sector in terms of exports and employment, and has earned international status in this very competitive and high technology gas turbine engine field. The engines are used in more than 40 models of general aviation type aircraft and helicopters which are in use in approximately 100 foreign countries.

Second Tier Companies (representative listing)

Company	*Products*	*Location*
Aviation Electric	Fuel control units R&O instruments	Montréal

Company	*Products*	*Location*
Bristol Aerospace	Airframe components Engine sheet metal components Aircraft overhauls Met and military rockets Solid propellants	Winnipeg
Douglas Aircraft of Canada	Wing assemblies other airframe components	Malton, Toronto
Dowty Equipment	Landing gears	Ajax, Ontario
Enheat	Airframe components	Amherst, Nova Scotia
Fleet Industries	Airframe components Sonobuoys	Fort Erie, Ontario
Garrett Manufacturing	Aircraft temperature controls	Rexdale, Ontario
Orenda Division, Hawker Siddeley	Gas turbine R&O Engine components Industrial derivatives engines	Toronto
Irvin Industries	Parachutes Cargo drop systems	Fort Erie, Ontario
Joly Engineering	Gearbox assemblies	Montréal
Leigh Instruments	Electro-mechanical aircraft systems	Carleton Place, Ontario
Lucas	Engine controls	Montréal
Menasco Canada	Aircraft landing gears and flight control systems	Montréal
Rolls Royce	Engine R&O Joint venture manufacture of industrial gas turbines	Montréal
Spar Aerospace	Gears, transmissions Instrument R&O Space Equipment	Toronto

Third Tier Companies

There are some 80 third tier companies whose main business is in aerospace products and services. Third tier companies generally do not have a proprietary product line but bid on general sub-contract work for the first and second tier companies. Companies specializing in repair and overhaul of aircraft or engines are also classified as third tier.

Most of these businesses are small, with sales of less than $1 million, but there are some notable exceptions, for example, Standard Aero in Winnipeg.

One distinguishing feature of all aerospace companies is their ability to meet the exacting quality standards associated with aerospace products. These standards are well defined and rigidly enforced by prime contractors and government procurement agencies.

Ownership

The Canadian government owns the two large aircraft companies, de Havilland and Canadair. The other prime, Pratt and Whitney, is mainly U.S. owned. In the second tier, more than 50 per cent of the companies are foreign-owned while in the third tier the companies are mostly Canadian privately owned. It is expected that an assessment by D. A. Golden, President, Telesat Canada, will provide the government with options regarding its ownership relationship with Canadair and de Havilland in the immediate future and in the long term.

Infrastructure

The industry is supported by central research facilities at the National Research Council, such as wind tunnel and structural test laboratories. The Department of National Defence (DND) also provides support through its research establishments and its standards laboratories.

Each of the larger companies maintains its own development and test laboratories including, for the engine companies, engine test cells.

Several companies, including de Havilland, Canadair, DACAN and Bristol Aerospace, are located at federally-owned airfields. There is pressure to use the airfields at the de Havilland and Canadair locations for housing or other development. New sites for aircraft final assembly and test will probably be necessary.

Regional Distribution

Major aerospace companies require ready access to a highly skilled labour force and a cadre of experienced managers and professionals. These are most readily found in or near large metropolitan centres. Major firms also tend to attract various supporting industries which receive sub-contracted work packages from the major firms and also provide specialized technological services.

As a result, most of the major aerospace manufacturing activities tend to take place in or around Toronto and Montréal. Repair and overhaul and the manufacture of certain sub-contracted parts tend to be located elsewhere in the country resulting in a regional employment distribution in 1976, 46 per cent Québec, 42 per cent Ontario, 3 per cent Maritimes and 9 per cent Western Canada. The corresponding population distribution (1976 census) is 27 per cent Québec, 36 per cent Ontario, 10 per cent Maritimes and 27 per cent Western Canada.

MARKET FACTORS

Domestic Market Structure

There are 630 companies in Canada engaged in air carrier operations, including trunk and regional carriers, flying clubs and flying schools. These organizations operate more than 20,000 civil registered aircraft (4,600 commercial aircraft) ranging from the large commercial jets to small private recreational aircraft — a diverse range of aircraft types. In addition, the Department of National Defence (DND) and various other federal and provincial government departments operate at least 250 aircraft.

Canada is the second largest user of aircraft in the free world. In view of this it may be surprising to find that only 5 per cent of registered aircraft and 12 per cent of commercial aircraft are of Canadian origin. Canada tends not to build small private-use aircraft because the financial and infrastructure costs of successfully designing, developing, manufacturing and marketing the total diversified range of aircraft in use is obviously beyond Canada's capacity. With the continuing success of the Twin Otter and the hoped for success of the DASH 7 and Challenger aircraft, a more significant penetration of the domestic market may be possible. The defence aircraft needs have been met, primarily, by licensed production of foreign designs to avoid uneconomic design, development and production costs in Canada for the relatively small Canadian market. The most recent procurement activity associated with new fighter aircraft (NFA) is geared to an off-the-shelf configuration. For sovereignty reasons, certain repair and overhaul and weapon systems capabilities are sought by DND in Canadian industry.

International Markets

The Canadian industry produces about 2.3 per cent of world aerospace requirements and this share has been constant since 1960. Other countries, notably France, Britain and Germany, have increased their share at the apparent expense of the United States over the same period. Although Canadian industry enjoys a certain degree of interdependence with the United States industry, whose sales at $24.5 billion are 67 per cent of Western World sales ($36.3 billion), it is clear that industrial collaboration with other countries' industries, notably European, can help increase Canadian access to the world markets as well as having a stabilizing effect. The industrial collaboration with the U.S. and other countries is currently centred on the supply of engines, aircraft systems, airframe components and machined parts. Significant further collaboration could best be achieved by association through joint ventures on new aircraft, engines and systems. This would follow a world trend to share the cost and risks of new aircraft and engine development. In terms of Canadian designed aircraft, engines and systems, the industry has effectively evolved specialized lines which are finding a ready international market. The PWC small jet engines, the DHC STOL aircraft and the Canadair Challenger are examples of products sold in international and domestic markets. The specialized range of systems includes, for example, landing gears from Manasco on many international aircraft types and the remote manipulator systems of SPAR for NASA.

Analysis of Trade Input-Output Model

Although current statistics preclude an accurate accounting model for the aerospace industry, a representative international and domestic trade input and output model as a composite of aircraft, engine, space and avionics products is provided on the following page. A supplementary breakdown by sub-sector is presented in Annex C.

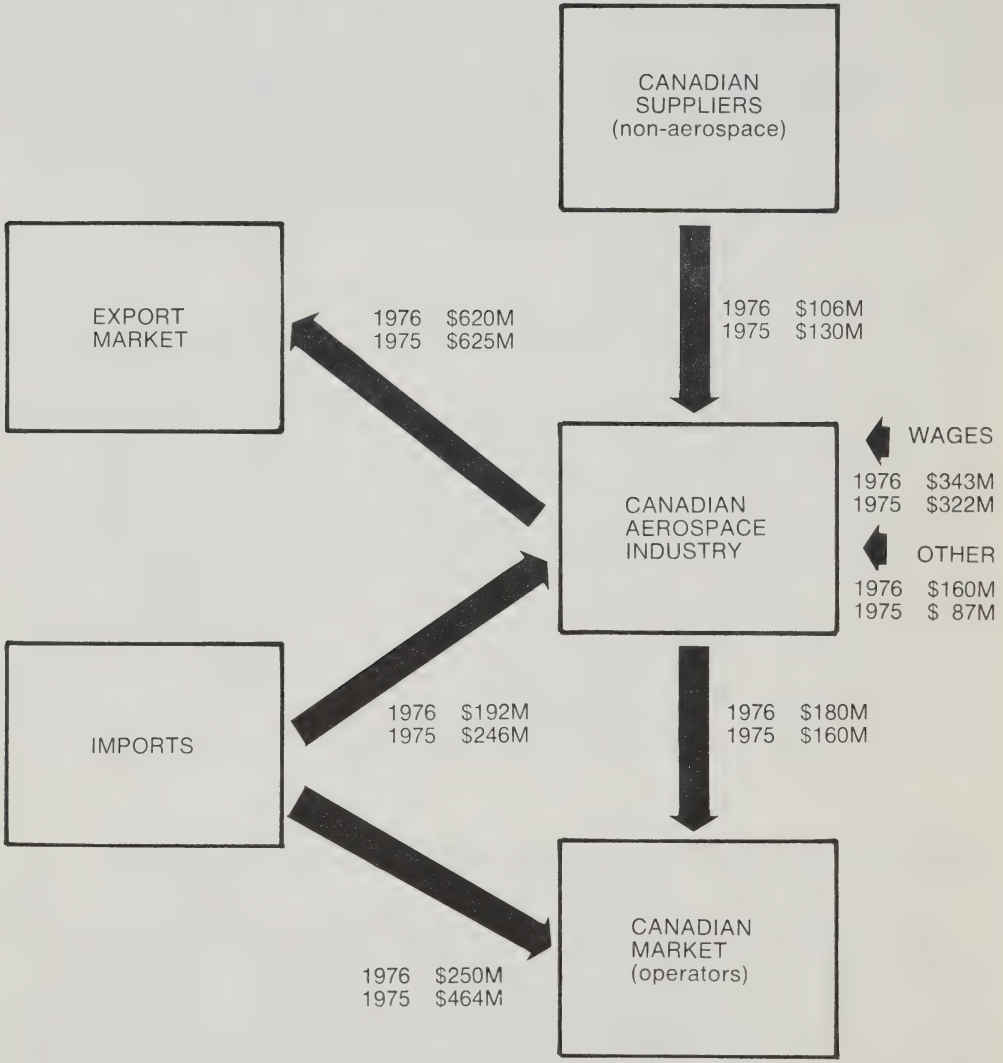
The model illustrates that the Canadian aerospace manufacturing industry is strongly dependent on international suppliers (mainly U.S.) for components and sub-systems, and is export-oriented. The Canadian market is correspondingly import-oriented.

For completeness , the model includes imports of aerospace products such as aircraft, engines, spares, etc., used in the Canadian domestic aerospace market *in addition to those imports used in direct Canadian manufacture of aerospace products.* It does *not show* the value of services accounted for by the activities of the non-manufacturing aerospace companies such as airlines, distributors and many aircraft servicing establishments. It is significant that since 1961 the total value of exports of manufactured aerospace products (SIC 321) has balanced the gross aerospace imports. The model reveals that on the manufacturing account (excluding direct imports to Canadian operators) there has been a net industrial trade balance, in favour of the Canadian aerospace industry, of $428 million in 1976 and $379 million in 1975. The industry satisfied 40 per cent of the Canadian aerospace market in 1976 and 25 per cent in 1975 but the 1976 ratio is high due to low airline and military aircraft purchases in that year. The corresponding overall trade balance in aerospace products is estimated at $178 million surplus and $85 million deficit in 1976 and 1975 respectively.

INTERNATIONAL TRADE IN AEROSPACE DEFENCE PRODUCTS

Defence related Canadian aerospace products enjoy duty-free entry to the U.S. from Canada through the Canada/U.S. Defence Production Sharing Agreement (DPSA). The agreement was sought, in 1959, due to a recognition by the Canadian government of the prohibitive cost of self-sufficiency in defence aerospace products, and the interest by the U.S. government for U.S. industry to provide our defence aircraft needs in exchange for equivalent economic benefits for Canada's aerospace industry. This bilateral agreement was to provide the opportunity for both defence industries to participate in U.S. and Canadian defence and procurements on a similar basis. To ensure that the Canada/U.S. defence production sharing is equitable there is an agreement that the value of cross-border defence procurements be kept in "rough balance" in the long term. Total value of contracts let to the end of March 1977 (including the Aurora) has been about $4 billion by each country, with a $409 million balance in favour of the U.S. (See Annex D). Notwithstanding the defence production sharing argeement, there are some non-tariff barriers to entry into the U.S. of aerospace defence products. These include:

REPRESENTATIVE INPUT-OUTPUT MODEL
CANADIAN AEROSPACE MANUFACTURING INDUSTRY
(Including Avionics)



1976 — Preliminary Data (as of March 77)
Models specific to the individual product sub-sectors are given at Annex C.

— restriction of opportunity to foreign companies in that product specifications for certain items to be purchased are not releasable to foreign companies on grouds of security;
— the application of technical barriers through specification of national or proprietary technology;
— procurement restrictions such as the Berry Amendment of 1972 to the Defence Appropriations Act which precludes the U.S. Department of Defence (DOD) from purchasing foreign food, clothing, synthetic fibres, etc. (e.g. life jackets for the U.S. Coastguard, parachutes for DOD). Waivers from this restriction can be obtained, however, given a determination that U.S. products cannot be obtained "as and when needed" at U.S. market prices. A rider to the Berry Amendment also restricted Canadian sales of specialty metals and products to the U.S. Armed Forces, although recent amendments to this provision are expected to alleviate this problem;
— The Armed Services Procurement Regulations Section 6-502(d) precludes government-owned corporations from being awarded defence contracts. In the case of de Havilland and Canadair a temporary waiver of this restriction has been granted until September 1978.

Under the DPSA, Canadian duties are applicable to military products purchased in the U.S. However, Canada affords duty-free entry for prime defence materiel.

Canada also has defence research and development and production agreements with several other NATO countries, notably with Britain and West Germany, on a project by project basis.

INTERNATIONAL TRADE IN AEROSPACE COMMERCIAL PRODUCTS

For imported commercial products, the U.S. applies a 5 per cent tariff on aerospace products including Canadian content of repair and overhaul. Canada has on the books a corresponding tariff on aircraft and engines of 7½ per cent but waives this annually on all aircraft and engines of type or size not manufactured in Canada. Parts of aircraft and engines of types and sizes made in Canada are subject to import duties of 7½ and 5 per cent respectively. Canada effectively permits free entry for most aerospace products.

The 5 per cent U.S. import tariff has a significant impact on the ability of Canadian exporters to be competitive in the U.S. market, partially due to the resultant price differential and partially due to overhead associated with the adherence to customs regulations. This tariff also constitutes a discouragement of non-U.S. manufacturers considering setting up Canadian operations to supply aerospace products for the North American market. Elimination of the Canadian and U.S. import duties for aerospace products is viewed favourably by the Canadian aerospace industry. Certain U.S. non-tariff barriers, for example the Buy America Act, can discourage the export of Canadian civil aerospace products to the U.S.

Although there is no evidence to suggest deliberate use as a non-tariff barrier by importing countries, airworthiness certification procedures and associated time limits for compliance can have serious economic and technical implications for Canadian aircraft under development.

European Communities (EC) countries levy import tariffs on aircrafts, engines and parts ranging from 5 to 7 per cent. Duty is waived for products in support of special projects, which are often of national significance. Finland is duty-free for aerospace products. Norway and Sweden impose 5 to 6 per cent duty on aircraft engines and parts. Elimination of these tariffs would also be beneficial to the sale of Canadian aerospace products but not to the same extent as the U.S. tariffs due to the relatively smaller volume of business opportunity. These countries also have a series of non-tariff barriers such as government procurement practices, licensing requirements, etc., which could affect future sales of Canadian aerospace products.

Procurement Offsets

It is becoming standard practice for governments to influence decisions relating to acquisiton of major aircraft fleets by national airlines and armed forces to gain "offset" benefits in the form of production to create employment; to acquire new management and technical skills; to offset unfavourable balances of payments; and to develop or maintain capabilities for life-cycle support of equipment. The Canadian government's approach to obtaining offsetting industrial benefits, associated with major aircraft procurements avoids compromising the users' operational requirements, and attempts to tailor the benefit package to the immediate and long-term needs of the aerospace sector and industry in general.

Due to the magnitude of the programs, offset work is necessarily a feature of the Aurora and NFA procurements. Although benefits are not in principle restricted to aerospace related industrial work, the offsets which can be offered and absorbed by Canadian industry are mainly aerospace in nature. It is important to note, however, that Canadian non-defence products are excluded from the tariff-free benefits of the Canada/U.S. Defence Production Sharing Agreement, and are thereby exposed to the applicable U.S. tariff.

For the NFA, three categories are being sought.

A. Benefits for the Canadian Aerospace Sector

These include benefits derived from direct involvement in the selected fighter aircraft, e.g. the establishment of a satisfactory Canadian industrial base for life-cycle support of military systems, manufacture of assemblies and components, production of installed avionics equipment, and all other benefits from aerospace activities. Examples are assistance in sales of Canadian aircraft such as the DASH 7 and Buffalo, avionics and other sub-systems for other military and civil aircraft; repair and overhaul and product support for external customers; research and development for aerospace programs; transfer of new technologies to Canada; joint ventures with Canadian industries; etc.

B. Benefits in the General Area of Non-Aerospace Defence Equipment

E.g., sale of vehicles and maritime equipment; participation in major systems produced abroad; transfer of new technologies to Canada; joint ventures with Canadian industries; etc.

C. Benefits not related to Defence or Aerospace Equipment

Sales of Canadian designed, manufactured equipment; management, production and marketing assistance; joint ventures and transfer of technology to establish computer design/manufacturing capabilities and to establish new product lines.

The achievement of offsets against airline purchases is more difficult but nevertheless provides substantial opportunities for Canadian business. These opportunities could best be taken early in the life cycle of the commercial aircraft in question.

A special aspect of procurement offsets, common to both defence and commercial programs, is the world trend towards international collaboration on new aircraft and engine programs. The stimulus is tremendous cost and the pressure on material and human resources. Thus, a measure of international rationalization of new product development and production is occurring. The Canadian industry is already responding to this trend, for example in the Canadair CL 289 drone program for the German army in collaboration with Dornier; and the SPAR remote manipulator system work for the NASA shuttle. A potential international collaborative program employing the DHC augmentor wing technology may also mature shortly.

COMPETITIVENESS

Factors

One measure of competitiveness of the Canadian industry is that 75 to 80 per cent of its output is exported and it has maintained a constant share of the world's aerospace market.

Measurement of competitiveness in comparative quantitative terms is difficult because many aerospace products are not sold on the basis of price alone. Prospective purchasers of complete aircraft, engines or major components take into consideration performance, quality and delivery in addition to price. In the general sub-contract or component market most work is secured by competitive price bidding and to be competitive, companies must have competitive technology through innovation and modernization.

Innovation

Aerospace products, such as complete aircraft, aero-engines and electrical, electronic and mechanical sub-systems, represent a complex and demanding application of advanced technology. The catastrophic results of failure have imposed high demands of quality and reliability on the products.

The requirement for maximum safety and performance with minimum weight is a major reason why aerospace design continues to emphasize the use of new and improved materials and advanced systems technologies.

The pace of technological advance is now so fast that new products become obsolescent quickly, sometimes even before they are fully developed. The challenge of bringing advanced complex products to operators in a reasonable time span — five to 10 years — has been met by the development of highly sophisticated management systems. The United States industry is a leader in computer aided design and manufacturing (CAD/CAM) and under this stimulus the leading Canadian companies have active programs to introduce or expand the applications of the computer to their operations.

Technology

A great deal of the technology is generated in the U.S. under the impetus of military programs and NASA sponsored research. Canada has added to the international fund of aerospace technology, especially in the product areas of STOL aircraft and small jet and prop-jet aero-engines. Unique work is now starting in the area of remote manipulator systems for spacecraft which should also find application in commercial areas.

The Canadian innovative aerospace effort has been maintained at a relatively low level compared with the U.S. and Europe and, as a result, the Canadian industry is highly dependent on access to technology from abroad. A current example is the Canadian Challenger aircraft which uses some U.S. technology in the wing design, a U.S. engine and several U.S. sourced sub-systems. This is not an unhealthy situation provided it is accompanied by appropriate information transfer and a reasonable base of Canadian technology is maintained. However, there are strong indications that the U.S. is tightening access to its advanced technology, preferring to export fully finished products such as aircraft rather than the know-how which permits competing countries to move ahead.

In order to maintain an access to foreign technology which may be necessary for the continued viability of a Canadian aerospace industry, it is likely that the Canadian expenditure on research and development will have to be increased and better focussed. Otherwise, the Canadian membership in the international aerospace industry will lose credibility and the generation of unique Canadian aerospace products, even in specialist fields, will inevitably decline.

Productivity

Productivity assessment is only practical for the aircraft, engines and parts sectors (SIC 321). The avionics industry is not readily separable from the general electrical and electronics industry since it shares common technology and manufacturing techniques. There is, therefore, no reliable statistical base to permit analysis of avionics as a separate industrial activity.

For the aircraft and engines sectors the results of a detailed productivity analysis* are provided in Annex E. Absolute productivity figure comparisons between the Canadian aerospace industry and foreign industries must be treated with caution. For example, even the largest Canadian aerospace firms are small in comparison with American counterparts and the detailed products and volume of manufacture are so different as to make direct comparisons misleading. The Canadian growth of productivity, however, may well indicate trends in competitiveness. The (1970-1975) annual rate of growth in output per employee and per production worker's hours worked were approximately 3 per cent as illustrated in Annex E. This rate is comparable to that of the Canadian manufacturing industry and was achieved over a period of declining market activity during which time, in real terms, the Canadian aerospace industrial output declined at a 5 per cent annual rate due to the world recession.

A comparison of wage rate statistics indicates that although 1976 Canadian aerospace hourly rates were lower than the corresponding American rates ($6.19 Canada vs. $6.45 U.S.) the rate of increase (1975-1976) in Canada exceeded that of the U.S. by approximately a third. The relatively higher Canadian labour rate compared with the U.S. together with recent evidence of improved American productivity trends could create a marketing problem for the Canadian products in Canada's largest market, the United States. The recent relative devaluation of the Canadian dollar eases the problem.

*Productivity in this context is defined as value-added (STATCAN definition) divided by either total employment or by the total number of related production manhours paid. These two figures may be used as proxies for industrial productivity. Value-added includes the product of unit cost and labour, rent of capital, and profit residuals including corporate taxes.

Corporate members of the Air Industries Association of Canada (AIAC) have provided their projections of future productivity computed on the same mathematical basis as the figures generated by Industry, Trade and Commerce. The AIAC forecast productivity as provided in Annex E is based in part on projected market conditions and market penetration of the aircraft and engine sub-sectors. The significant comparative increase over past performance of the aircraft and parts sub-sector undoubtedly reflects the expectations associated with Canadair's Challenger business jet, which already has approximately 100 advance sales. The forecast improvement in productivity also reflects the industry's optimism that the Canadian aerospace business decline can be arrested by the impact of de Havilland's and Canadair's aircraft programs and DND's Aurora and new fighter procurement programs, plus the continued success of Canadian engine products and commercial airframe components.

INVESTMENT AND FINANCING

Profitability

Profitability in the aircraft and parts sub-sector (SIC 321) fluctuated quite erratically from a negative return on equity in 1968 to a maximum of plus 7.7 per cent in 1973. Overall, during the period in current dollars, the aircraft and parts sub-sector made a small profit of $3.5 million on sales of $4,604 million (0.1 per cent). Actual results are shown in the table at Annex F. If the calculation is repeated in constant 1976 dollars the industry had a negative return in the period.

Direct comparison between the aircraft and parts sub-sector and other manufacturing sub-sectors in the metal fabricating and machinery areas indicates that aerospace profitability tends to be relatively very low.

Comparison with foreign industry in particular American, indicates that low levels of profitability are a characteristic of the aerospace industry. A major aircraft manufacturer, for example, in the period from 1968-76 generally achieved a return on sales of less than 3 per cent. The U.S. aerospace average profitability in 1975 was 2.9 per cent on sales compared with a figure of 4.5 per cent for all manufacturing industries.

Financing

Aerospace is a high technology industry which requires a large amount of capital to finance its programs. Ideally, the industry should generate its funds from two internal sources: profit and depreciation (capital cost) allowances. If either or both of these elements are inadequate then financing for new ventures will not be available from within the industry.

The following table indicates the funds generated from operations in the Canadian aircraft and parts sector, and available for debt retirement, dividends, equipment, construction and financing of new programs. The table also includes actual capital expenditures on new equipment and construction.

Funds Generated Canadian Aerospace Industry (STATS CANADA)

	Profit (1)		*Depreciation (2)*		*Funds (1)+ (2) From Operations*		*Capital Expenditures*	
	$ Current	*$76*	*$ Current*	*$76*	*$ Current*	*$76*	*$ Current*	*$76*
1968	$(33.4)m	$(58.4)m	$33.8m	$59.1m	$ .4m	$ .7m	$24.9m	$43.5m
1969	2.0	3.4	37.7	63.5	39.7	66.9	26.4	44.4
1970	(8.3)	(13.6)	16.0	26.3	7.7	12.7	13.7	22.5
1971	(1.1)	(1.8)	16.0	25.8	14.9	9.9	9.9	15.9
1972	17.7	27.3	14.7	22.7	32.4	50.0	8.3	12.8
1973	15.2	21.1	14.6	20.3	29.8	15.9	15.9	22.0
1974	11.4	13.3	12.1	14.11	23.5	13.2	13.2	15.4

The table highlights a number of problems. The funds generated from operations are insufficient to facilitate the undertaking of new high-cost major development programs. Expenditure on new capital equipment is barely offsetting depreciation. The main remaining source of commercial funds is through debt financing. Low and inconsistent profit levels are a discouragement to financial institutions to provide the necessary capital for major development programs.

New Capital Investment Per Employee

The figures in the table below indicate the new capital investment in Canada is lagging behind the U.S. In 1975, for example, Canadian companies spent $571 per employee on new equipment against an investment of $976 per employee by their American counterparts.

New Capital Investment per Employee

	CANADA		*U.S.*	
	Current $	*1976$*	*Current $*	*1976$*
1968	$520	909	573	1,000
1969	594	1,000	592	997
1970	375	617	471	775
1971	264	425	400	645
1972	289	446	466	719
1973	503	699	599	776
1974	465	542	829	967
1975	571	599	976	1,000

Although the last federal budget made some concessions in terms of incentives for companies to invest in research and development and capital equipment, the industry still faces problems. Capital cost allowance regulations permit only the original cost of an item to be depreciated. Since replacement costs of advanced machinery are considerably higher than original costs because of inflation and/or increasing sophistication, depreciation allowances do not generate funds to finance sophisticated modern machinery. The government partially offsets this through the Defence Industry Productivity (DIP) program where assistance may be given to companies to undertake development or to acquire new capital equipment. Programs initiated under DIP must either be repaid out of the profits generated by the program or reinvested in research and development. The government regulations control the level of profit.

The Department of Supply and Services (DSS) negotiates contracts on behalf of the Canadian government and also on behalf of foreign governments (through the Canadian Commercial Corporation) with profit ceilings which are perceived to be low during inflationary times. Moreover, the companies are not permitted to include interest charges or selling expenses when calculating their costs and profit is not normally permitted on supported development programs. This contrasts with the situation in the U.S. and Europe.

There are other disincentives to investment: new development programs are very expensive, carry high risks and offer long pay-back periods typically of five to 10 years. As a result the industry continues to rely on government support for major new ventures or new equipment. There is, however, a possibility that the concentration of government support on major aircraft and engine programs in recent years may have resulted in inadequate support being available for the preservation of the industry's general technology base.

Government Financial Support

Aerospace industries throughout the world are generally recognized as requiring government support, particularly in the areas of research , development and equipment modernization. To sustain a viable Canadian aerospace industry in a highly competitive world market, it has been necessary to provide similar government assistance in Canada. Annex G shows funds expended by the Canadian government through its major assistance programs in support of the various sectors of the industry during the years 1967 through 1976. The disbursements of government support via Defence Industry Productivity Programs (DIP), Program for Advancement of Industrial Technology (PAIT), Industrial R & D Incentive Act Program (IRDIA), and Defence Industry Research Program (DIR) are as follows:

Disbursements of Government Innovative Support
Government Fiscal Years 1967/68, through to 1975/76

Sub-Sector	Disbursements	$ Millions Sales	Disbursements as % of Sales
		Calendar years 1967-75	
Aircraft, Airframe and Parts	168.7	2,896	5.8
Engines and Parts	102.4	2,379	4.3
Avionics	75.1	1,214	6.2
Total Aerospace Sector	346.2	6,489	5.3*

**An analysis of the industry trade flows shown on the input-output model reveals that for the years 1975 and 1976 the average Canadian content of Canadian aerospace production was 72 per cent. An Alternate expression of the government's innovative support to the aerospace industry is therefore 7.5 per cent of the Canadian content of production.*

In the past, government support has included the government defence procurement policy, EDC financing and guaranteed loans and international trade and marketing services. Contribution of this multifaceted government support to the Canadian aerospace industry is seen as an underlying necessity to the achievement of industrial stability.

There is an anomaly in the financing of U.S. aerospace products which results as a disincentive for Canadian aircraft operators to buy U.S. products with significant Canadian content. Under present U.S. export financing procedures it is not possible to finance the Canadian content of U.S. aircraft destined for the Canadian market. For an example, DACAN builds wings for DC 9 and 10 aircraft. The wing represents a significant part of the aircraft. Canadian operators cannot finance the value of the aircraft's wing through either EDC or EX-IM of the U.S. As a result it may be financially more attractive for a Canadian operator to buy Boeing or Lockheed aircraft which have significantly less Canadian content rather than a McDonnell Douglas aircraft with substantial Canadian content. The indirect result is to discourage American industry from setting up Canadian operations.

EMPLOYMENT

Factors

The aerospace companies provide challenging employment for virtually all skill levels used by the industry. For an indication of the distribution of employment type throughout the sector, see Annex J.

However, the industry has been characterized by sharp fluctuations in the level of business which has led to unstable levels of employment. As a result, Canadian aerospace companies have experienced some difficulty in recruiting professional and techinical staff. Canadian educational institutions have generally not emphasized training for the industry and a high proportion of recruits at all levels have been from abroad.

The companies provide extensive formal and on-the-job training. For example, in the last decade Canadair has provided more than half a million hours of training to employees.

With the stabilizing effect of new programs and opportunities in the industry it is believed that the industry will become more attractive to young Canadians. However, major companies will undoubtedly seek immigrants to fill specialized positions especially associated with opportunity programs such as Canadair's Challenger business jet.

The Department of Manpower and Immigration made a functional analysis of the employment aspects of the Canadian aircraft manufacturing industry in 1968 in conjunction with ITC and industry. The analysis was intended as a first step in the identification of manpower requirements in terms of the functional capabilities required. The activity then lapsed, possibly as a result of the decline in activity in the sector which alleviated critical employment problems in the short-term.

Labour Relations

Labour relations in most companies are satisfactory. Two of the largest aircraft and engine companies have had major labour disputes during the past three years primarily on issues of union security (the Rand Formula) and wage parity with the United States.

GOVERNMENT INVOLVEMENT

Industry/Government Interface

There is regular consultation between the industry sector and government primarily through the Air Industries Association of Canada (AIAC) and through a Sector Advisory Committee. Government officials are invited as observers to many specialist AIAC sub-committee meetings dealing with technical, financial and training aspects of the industry. The AIAC holds semi-annual meetings to which senior government officials are invited to discuss matters of common interest, such as maintenance of the technology base in the industry and international marketing.

Industrial Development Strategy

Economic industrial stability within the aerospace sector is a principal objective of the government. Industrial development strategy to achieve this stability includes:

- — support of selected industrial capabilities in research, design, development and production of products with good prospects for exploitation in domestic and export markets;
- — encouragement of industry to develop the technological capability to meet the support needs of national defence;
- — encouragement to achieve an internationally competitive sub-contracting base and in-plant repair and overhaul capability;
- — promotion of a satisfactory and economically viable regional distribution of industrial activity.

Rationalization of the Airframe Sector

The main aircraft companies, de Havilland and Canadair, were purchased from their foreign owners by the Canadian government in 1974 and 1976 respectively to ensure their long-term operation in Canada. A sale of the companies to the private sector is planned when feasible. Meanwhile, steps have been taken to strengthen the long-term work base by the support of major new aircraft programs at both companies. An assessment of the options for the future organization of the companies, which may involve a degree of rationalization of functions and facilities, is underway by Mr. D. Golden, President, Telesat, with industry and departmental assistance. A report from Mr. Golden to the Minister of Industry, Trade and Commerce is expected in 1978.

Government Procurement

Major procurements by the Canadian Armed Forces, while substantial, have been cyclical and infrequent and the trend is now towards off-the-shelf purchases abroad. The repair and overhaul sub-sector has received moderate employment from DND but the lack of systems engineering participation on new programs by the Canadian aircraft companies causes the R&O activity to be of a routine maintenance nature. The industry has not enjoyed a satisfactory stimulus in technology from defence equipment purchases for many years. Even the Aurora purchase has so far failed to provide such a stimulus. Hopefully, the early co-operation between government and industry in defining the NFA procurement criteria can redress the situation.

The DND has announced a policy of spending up to 5 per cent per annum of its capital budget in industry on defence related research and development. The thrusts of the proposed spending have not yet been defined but it is reasonable to expect that the aerospace industry can be a major beneficiary. This would complement the innovative funding by ITC under DIP.

It is essential to have good co-ordination of the procurement of aerospace products and services and of air transportation regulations, by government, which involves consideration of complementary industrial benefits to Canada. The foreign governments, including the United States, appear to have developed more co-ordinated procurement and regulatory policies and practices in the interest of their economic well being.

Development of Proprietary Canadian Products

The development of a sustainable product line has been achieved successfully with PWC small aero-engine programs, the Twin Otter and Canadair's Surveillance drone and is being attempted with the Canadair Challenger and the de Havilland DASH 7. Other companies, such as Menasco, SPAR, CAE and Garrett, also have successful proprietary product lines. The development process is, however, costly and since the companies tend not to generate sufficient funds internally to pay for new development programs, considerable government help, either directly in the form of grants or loans, or indirectly in the form of loan guarantees, has been required. For example, the DASH 7 program cost the government $90 million in direct financing and has required the provision of a letter of comfort to the banks essentially underwriting $70 million in production costs. Pratt and Whitney Aircraft receives approximately $10 million per annum in direct support to sustain the PT6 and JT15 engine programs less repayments averaging about $3 million per year. Additional support will be required shortly for a new program. Canadair's Challenger program has required a government guarantee of $70 million before the banks would advance the necessary development and production financing.

Assistance by Foreign Governments to Competitors

While a satisfactory data base is lacking on the extent and nature of foreign government support to competitors, there is evidence that the support given is greater than that provided to the Canadian industry. In particular, there is significantly higher and more stable direct and indirect support provided by the U.S., French, German and British governments.

The timing and allocation of government procurements is adjusted in part with a view to stabilizing and strengthening their industries and to obtain export effectiveness. The level of Canadian support in respect of engine development — an area where a direct comparison is meaningful — is about 60 per cent of the support level provided by the United States government to its companies.

A comparable table of government and industry expenditures on R&D for 1973 is shown at Annex H. The table shows that government funded aerospace research and development as a percentage of total aerospace R&D is much lower than in the U.S., France, Britain or Germany.

OUTLOOK FOR THE INDUSTRY

Market Trends

The market for STOL utility aircraft in which DHC specializes is constantly on the increase. As Canada develops, particularly in the Northwest Territories, Yukon and the northern portions of the provinces, there is a progressively increasing demand for modern utility aircraft. The fact that considerable numbers of surplus military DHC-2 Beavers and DHC-3 Otters are finding their way back into the Canadian market is indicative of the growing demand.

The export market is growing with economic development in the third world countries along with continued growth in population. For example, Indonesia today has three airlines operating domestically as well as some 20 charter operators compared to two or three 20 years ago. There are more than 200 transport type aircraft operating in Indonesia today. Emerging third world countries are all updating their internal domestic carriers to modern aircraft. There is a similar trend in military applications in third world countries. For example, Kenya, Sudan, Zaire, Zambia, Togo and UAE have all purchased Buffalos to replace DC-3s and the like. This trend to acquire good utility transport aircraft by third world countries should show a sharp increase in the next decade.

High density STOL service in North America has not yet developed as originally expected. Although initial DASH 7 sales are correspondingly far below expectations, it is still anticipated that the DASH 7 will secure a penetration of the airline commuter market as fuel economy and environmental factors become increasingly critical requirements.

A developing market sector is the business aircraft sector which has continued to grow even during the era of economic recession. Canadair has already sold about 100 of its Challenger aircraft in advance of first flight and certification. The total program is based on an expectation that sales will be at least 250 aircraft, including cargo variants. A steady small market is also foreseen by Canadair for its CL 215 Water Bomber although the relative high cost of ownership and operation and limited scope of use are expected to continue to inhibit sales.

The sector expects an influx of work associated with the Aurora and NFA procurements. For the Aurora there are $414.6 million offsets guaranteed under penalty. The total Auroa offset work packages are expected to amount to more than $900 million. The value of offset work which can be secured by Canadian industry as a result of the NFA procurement is not yet known.

The PT6 and JT15 engine products are well established in the international marketplace but are subjected to aggressive competition. The technology on which the engines are based is at least equal to that of competitors in other countries. In centrifugal compressor technology, PWC is an acknowledged world leader.

Aviation Electric is utilizing hybrid computer simulation techniques, in conjunction with the National Research Council, to investigate the development of promising new micro-computer controlled fuel control systems for small aircraft and helicopter engine systems.

The second tier systems contractors can profit from the increasing aircraft activity and to a lesser extent from the increasing engine sales. A substantial increase in the volume of engine related sub-contract work in Canada can only come from the introduction of new Canadian-designed engine models, and possibly the licensing of engine production as part of the NFA program. Engine components currently sourced by PWC outside Canada are not required in sufficient volume to warrant the cost of setting up manufacture in Canada.

Several second tier systems companies are experiencing growth by exhibiting strong systems design skills. Examples are Menasco Manufacturing in landing gears and SPAR Aerospace on space related hardware. The design capabilities of both companies have been nurtured by selective DIP assistance. SPAR is receiving significant development and hardware contracts through NRC and the Department of Communications as a core space industry company. Menasco is currently supplying its landing gears/flight control systems on 10 major foreign aircraft programs and to DHC.

The maintenance and expansion of sub-contract machining and sheet metal work in the future is dependent upon continuing and adequate modernization of related production equipment.

Forecast Sales and Employment

A forecast of sales and employment based upon industry predictions is provided in Annex A. The forecast suggests a recovery and subsequent levelling off in 1980 ($ 1976) at $1 billion sales and approximately 32,000 employees. These figures include an allowance for the avionics sub-sector. Corresponding figures for the aircraft, engines and parts sub-sectors (SIC 321) are $775 million sales and 25,000 employees (up 5,000 from the most recent low 1976 level of 20,000 and evidently reflecting the industry's assessment of the impact of the NFA, Aurora and Challenger aircraft, together with expectations for the DASH 7). The growth predicted by industry may be optimistic: the principal objective of government is to achieve long-term stabilization of the industry's economic and technological base.

Technological Thrusts

The future use of aircraft, like most transportation systems, will be affected by the availability and cost of oil-based fuels. For the next two decades, at least, there appears to be no prospect of a conversion to alternative fuel systems, for example those based on hydrogen. An increase in the expense of operation of aircraft seems inevitable. More productive energy efficient aircraft will be required. The DASH 7 aircraft type and later variants, the Challenger and the PWC range of engines are already tuned to this trend.

Additional development of more efficient systems for aircraft and engines, mainly through lower weight, will be required if Canadian industry is to maintain or increase its share of world aerospace projects. Examples are the introduction of fly-by-wire flight control systems and increasing conversion of mechanical to sophisticated electronic systems.

A manufacturing problem common to all three tiers is the cost of keeping up-to-date in competitive manufacturing methods for airframe related components. The newer defence aircraft, such as new fighters, employ advanced technologies in titanium machined and welded structures, advanced riveted systems and in high modulus plastic composite structures, which are not well based in Canadian industry. A selective and accelerated program of modernization of manufacturing methods will be essential to take advantage, for example, of direct program related NFA offsets.

The requisite technology cannot be transferred to Canada in its entirety by procurement elsewhere. Specialized efficient Canadian capabilities are a prerequisite for product development and manufacturing. The capabilities can only be acquired through a well-balanced program of R&D which

also provides an attractive environment to hold and stimulate talented, innovative scientists and engineers. Without such a Canadian-based program, the benefits of the transferred manufacturing and managerial technologies through offset leverage will be essentially short-term.

Productivity and Competitiveness

The industry is very concerned about its future competitiveness, even if its technological capabilities can be maintained, due to an erosion of labour cost advantage. For example, the American general aviation industry provides major competition to the DHC Twin Otter and its average labour rate is now $1.40 per hour less than DHC. When wage and price controls are lifted this gap may widen. The reduction in value of the Canadian dollar relative to the U.S. dollar is having a modifying positive effect but it is clear that a more productive use of Canadian resources will be necessary to maintain competitiveness. The achievement of increased productivity is, of course, fundamental to the future success of all industry sectors relying on exports. The aerospace industry must improve productivity across the whole span of industry functions, i.e., research, design, development, manufacturing and marketing.

The industry has recognized the necessity to focus its efforts on productivity improvement and under the auspices of the Air Industries Association of Canada and with the encouragement of Industry, Trade and Commerce, has already initiated "Productivity Aerospace Program" to seek appropriate solutions. The program seeks to improve productivity in three main areas — in management systems, operational methods and in the activities of government and the larger companies which can affect the business environment for the sector.

ANNEXES

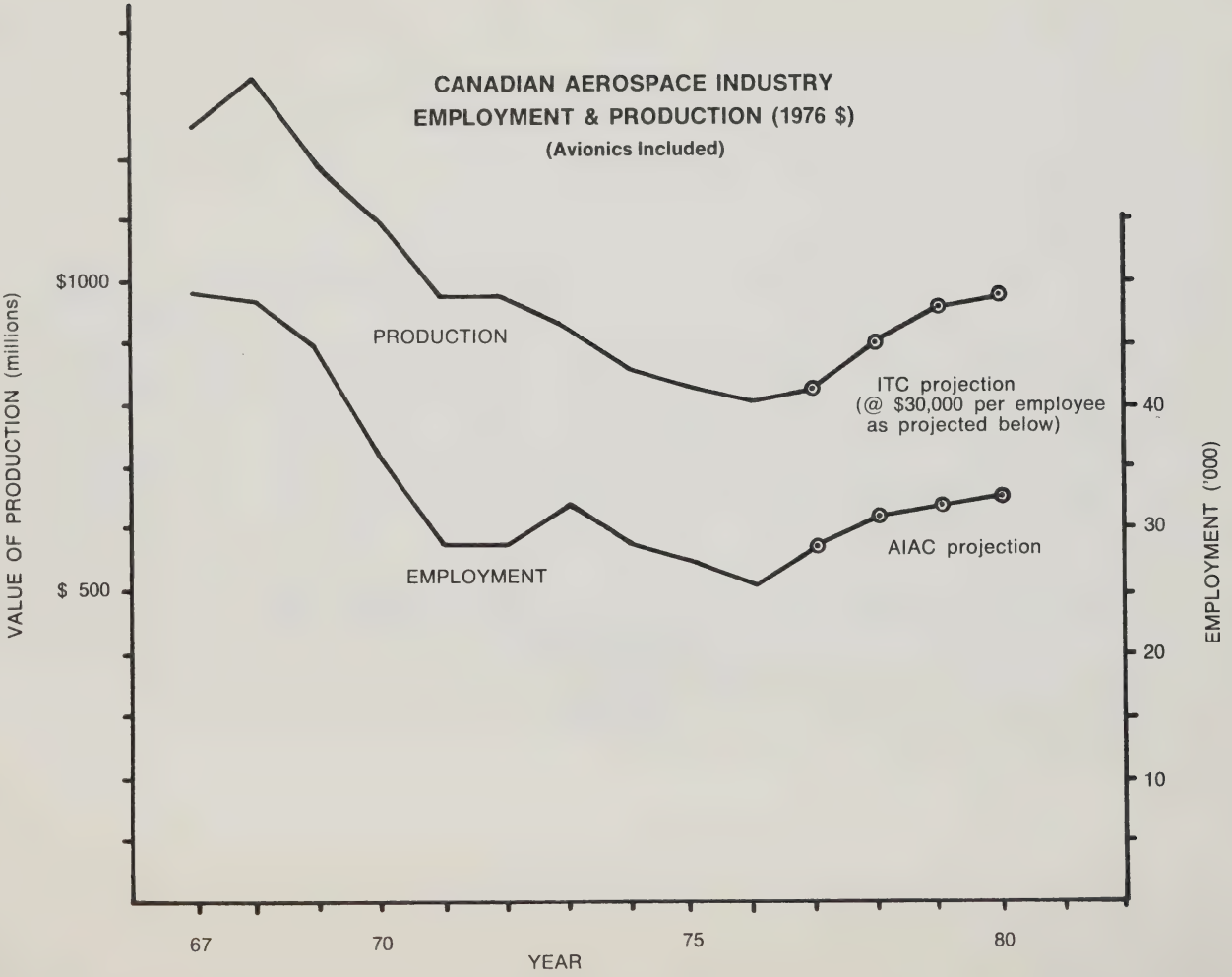
A Sales and Employment Record and Forecasts
B Selected Statistics for Canadian Manufacturing Industries
C Input/Output Models
D Statistics on Canada/U.S. Defence Production Sharing
E Productivity Analyses
F Relative Profitability
G Government Support
H R&D Expenditures on Aircraft and Parts 1973
J Distribution of Employment Type (AIAC)

ANNEX A

Canadian Aerospace Industry Statistics
(Avionics Included)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976[a]	1977[a]
							(Millions of Dollars)								
Sales:															
Total	550	589	541	594	680	750	695	659	596	625	662	729	785	800	872
Defence	363	365	335	297	367	412	366	344	286	219	218	233	251	288	340
Commercial and civil	187	224	206	297	313	338	329	315	310	406	444	496	534	512	532
Domestic	327	305	290	294	278	191	198	177	173	115	146	145	160	180	230
Exports*	223	284	251	300	402	559	497	482	423	510	516	584	625	620	642
Imports	182	156	236	279	410	465	434	420	313	354	546	707	710	442	474
New Capital Expenditures	n.a.	18	22	26.7	26.7	39.0	29.6	16.4	9.8	10.3	16.6	15.4	18.6	13.2	18.9
Employees (thousands)	n.a.	37.5	37.9	45.9	48.1	47.8	44.4	35.8	28.7	28.8	31.7	28.4	27.3	25.3	27.4

[a]*Preliminary*
**Includes re-exports*
Source: Department of Industry, Trade and Commerce 27 April 1978


CANADIAN AEROSPACE INDUSTRY
EMPLOYMENT & PRODUCTION (1976 $)
(Avionics Included)
VALUE OF PRODUCTION (millions)
$1000
$ 500
PRODUCTION
EMPLOYMENT
ITC projection
(@ $30,000 per employee
as projected below)
AIAC projection
EMPLOYMENT ('000)
40
30
20
10
67
70
75
80
YEAR

ANNEX B

SELECTED PRINCIPAL STATISTICS
OF THE MANUFACTURING
INDUSTRIES OF CANADA

Selected Principal Statistics of the Manufacturing Industries of Canada
(Thousands of Dollars)

Major Group	SIC Code	Description		Employment: Production Workers (No.)	Employment: Total (No.)	Value of Shipments	Value Added: Manufacturing Activity	Value Added: Total Activity	Val. of Shipments / GNP	Exports[1]	Imports
		Transportation Equipment Industries							%		
	321	Aircraft and Aircraft	—1974	14,442	24,143	612,564*	381,156	393,501	0.42	433,425	667,143
		Parts	—1975	13,864	22,289	744,437*	425,539	438,036	0.46	421,494	668,586
	323	Motor Vehicle	—1974	35,099	49,402	5,381,924	1,388,900	1,999,501	3.72	3,611,000	2,981,000
		Manufacturers	—1975	31,694	45,256	6,024,429	1,171,007	1,758,047	3.73	4,211,000	3,536,000
	3241	Truck Body	—1974	4,668	5,667	178,271	79,881	87,533	0.12	4,171	78,711
		Manufacturers	—1975	4,544	5,428	197,235	91,250	101,919	0.12	3,563	79,321
	3242	Non-Commercial Trailer	—1974	8,083	9,429	410,815	135,508	135,969	0.28	included in 3241	
		Manufacturers	—1975	7,933	9,385	459,910	157,547	159,121	0.29	,,	,,
	3243	Commercial Trailer	—1974	2,525	3,556	138,385	61,156	65,850	0.10	,,	,,
		Manufacturers	—1975	1,897	2,875	116,963	52,225	56,112	0.07	,,	,,
	325[2]	Motor Vehicle Parts	—1974	41,249	49,642	2,281,103	1,026,729	1,042,950	1.58	2,125,000	4,460,000
		and Accessories	—1975	34,907	42,639	2,325,802	1,008,395	1,028,860	1.44	2,298,000	2,984,000
	326	Railroad Rolling	—1974	6,003	7,975	441,025	165,197	210,242	0.30	39,418	82,593
		Stock industry	—1975	6,336	8,664	587,643	217,804	267,150	0.36	70,439	109,033
	327	Shipbuilding and	—1974	12,664	14,725	468,711*	240,257	241,627	0.32	73,397	60,878
		Repair	—1975	14,253	16,344	571,668*	297,101	297,701	0.35	190,080	58,499
	328	Boatbuilding and	—1974	3,304	3,940	107,812	51,276	51,957	0.07	28,345	44,494
		Repair	—1975	3,290	3,781	109,774	50,037	51,198	0.07	18,595	43,496
	329	Miscellaneous Vehicles	—1974	2,370	3,491	129,140	41,226	46,842	0.09	113,167	161,589
		Manufacturers	—1975	2,065	2,981	120,503	45,536	50,393	0.07	138,827	175,546

[1]*Excludes re-exports*
**Value of Production*
[2]*SIC Code 325 includes only 205 companies out of a total 462.*
Source: Statistics Canada

Major group	SIC code	Description		Employment: Production Workers (No.)	Employment: Total (No.)	Value of Shipments	Value Added: Manufacturing Activity	Value Added: Total Avtivity	Val. of Shipments / GNP	Exports[1]	Imports
1	100-	Food and beverage	—1973	154,728	237,532	12,375,346	3,970,269	4,222,961	10.28	1,370,431	1,125,211
	147	industries	—1974	137,900	189,300	14,712,922	4,455,565	4,764,432	10.44	1,247,657	1,326,684
10	270-	Paper and allied	—1973	93,123	123,143	5,271,027	2,438,652	2,476,434	4.38	2,623,003	205,783
	274	industries	—1974	96,700	128,000	7,458,598	3,885,434	3,942,030	5.29	3,995,573	293,528
12	290-	Primary metal	—1973	89,813	116,209	5,001,764	2,334,685	2,409,344	4.15	2,226,967	996,194
	298	industries	—1974	94,700	124,700	6,542,875	2,945,754	3,016,225	4.64	2,845,778	1,807,437
13	300-	Metal fabricating	—1973	111,065	145,344	4,539,420	2,321,604	2,437,662	3.77	219,717	749,617
	309	industries (except machinery and transportation equipment industries)	—1974	95,100	129,200	5,428,133	3,032,893	3,190,625	3.85	322,502	1,008,733
18	360-	Petroleum and coal	—1973	6,822	16,087	3,073,197	573,928	580,695	2.55	218,823	212,822
	369	products industries	—1974	7,100	17,700	4,904,397	967,662	978,252	3.48	371,685	372,190
19	370-	Chemical and chemical	—1973	39,447	77,248	3,503,804	1,802,045	1,975,636	2.91	540,650	1,174,207
	379	products industries	—1974	37,600	74,300	4,537,471	2,334,439	2,578,839	3.22	731,428	1,735,965
16	330-	Electrical products	—1973	82,023	127,928	3,537,898	1,793,396	2,086,408	2.94	491,682	1,476,034
	339	industries	—1974	85,600	132,700	4,311,605	2,216,055	2,520,040	3.06	611,789	1,842,356
8	250-	Wood industries	—1973	102,847	119,303	4,055,531	1,946,073	1,975,837	3.37	1,900,693	261,753
	259		—1974	64,500	77,200	3,462,198	1,708,138	1,747,418	2.46	1,573,513	356,860
	100-	All manufacturing	—1973	1,290,275	1,772,109	66,772,992	28,823,204	30,890,503	55.44	24,453,532	22,932,958
	399	industries	—1974	1,134,900	1,575,400	80,291,504	35,182,096	37,758,458	56.99	31,123,622	31,179,860

Gross National Product (current dollars) 1973: $120,438M — 1974: $140,880M

[1] *Excludes re-exports*

Source: Statistics Canada

All 1974 figures are preliminary or estimated.

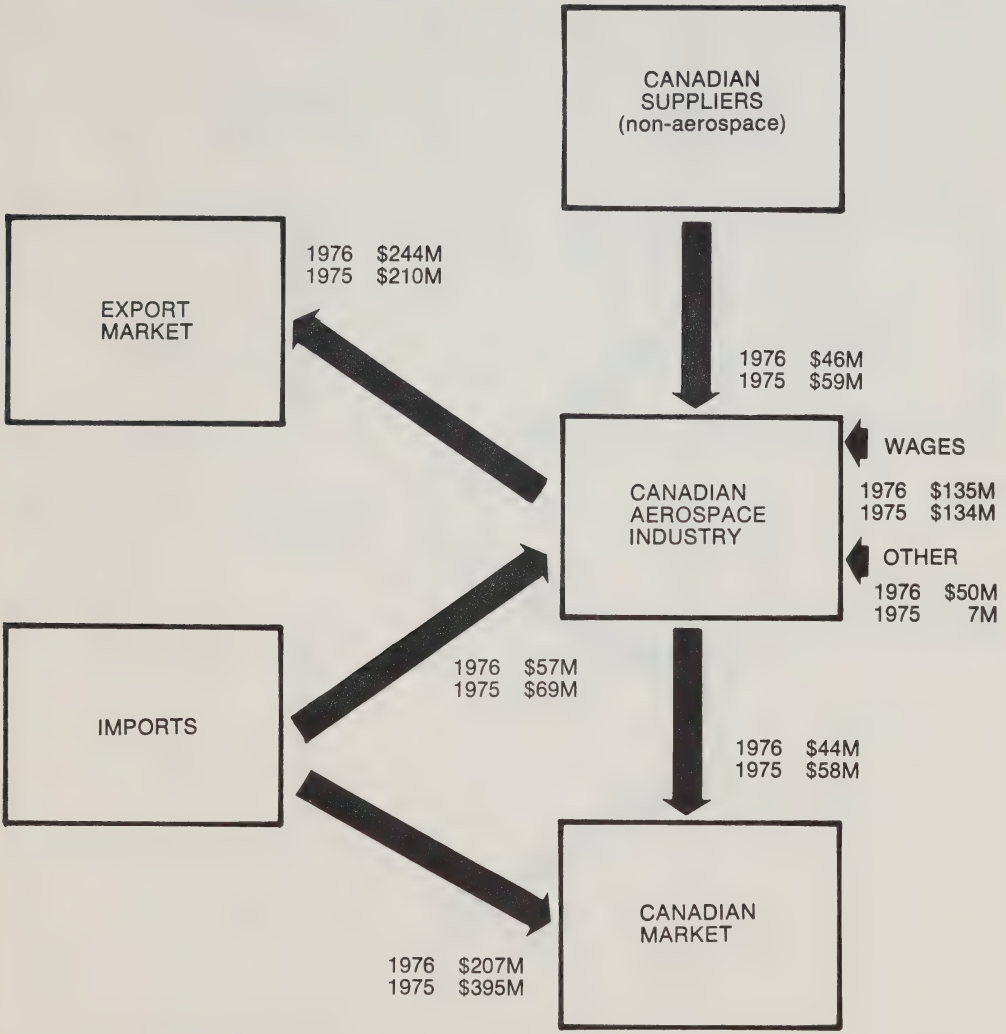
ANNEX C

REPRESENTATIVE*
INPUT/OUTPUT MODELS
FOR INDIVIDUAL AEROSPACE
PRODUCT SUB-SECTORS

Appendix I — Aircraft and Parts
Appendix II — Engines and Parts
Appendix III — Avionics and Space

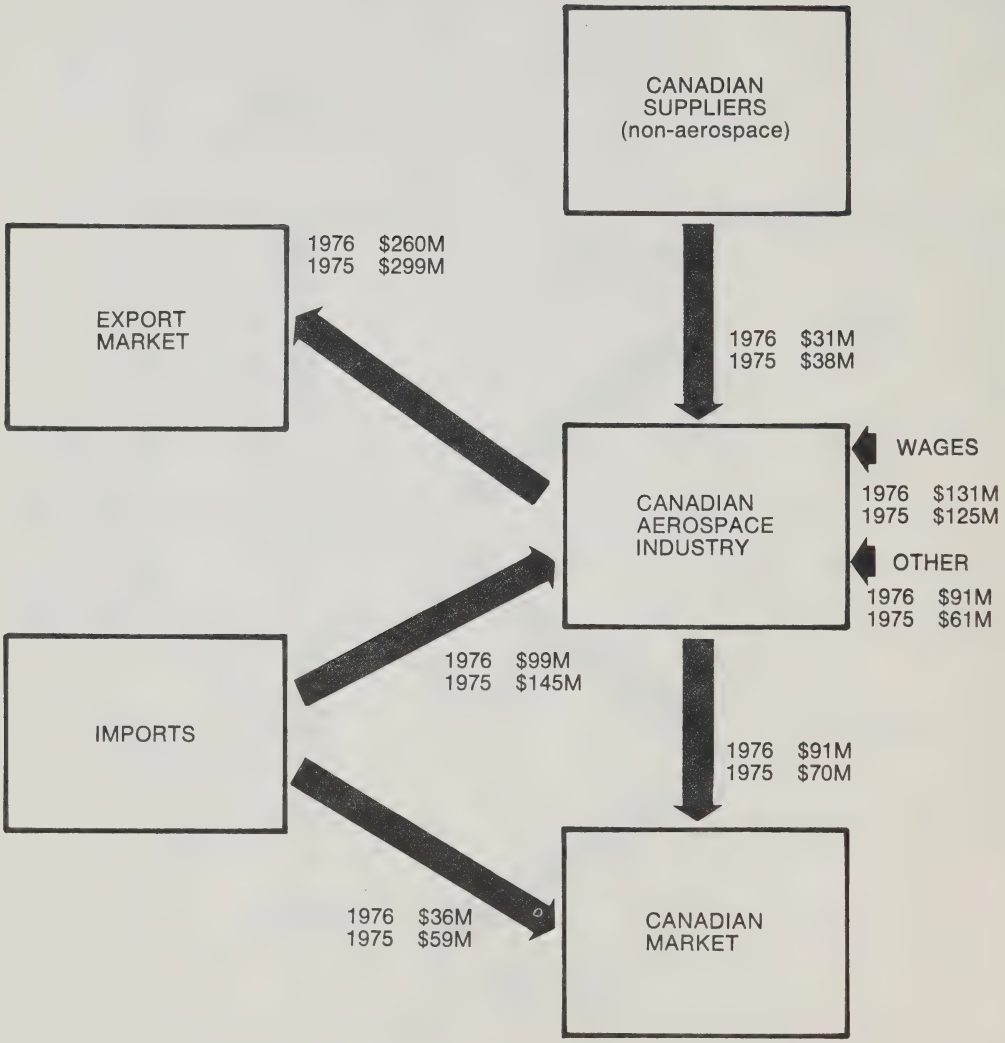
*Due to inadequate statistical base, the models presented herein are not accounting models, but are corresponding estimates.

INPUT-OUTPUT (REPRESENTATIVE)
CANADIAN AEROSPACE
ENGINES & PARTS SUB SECTOR



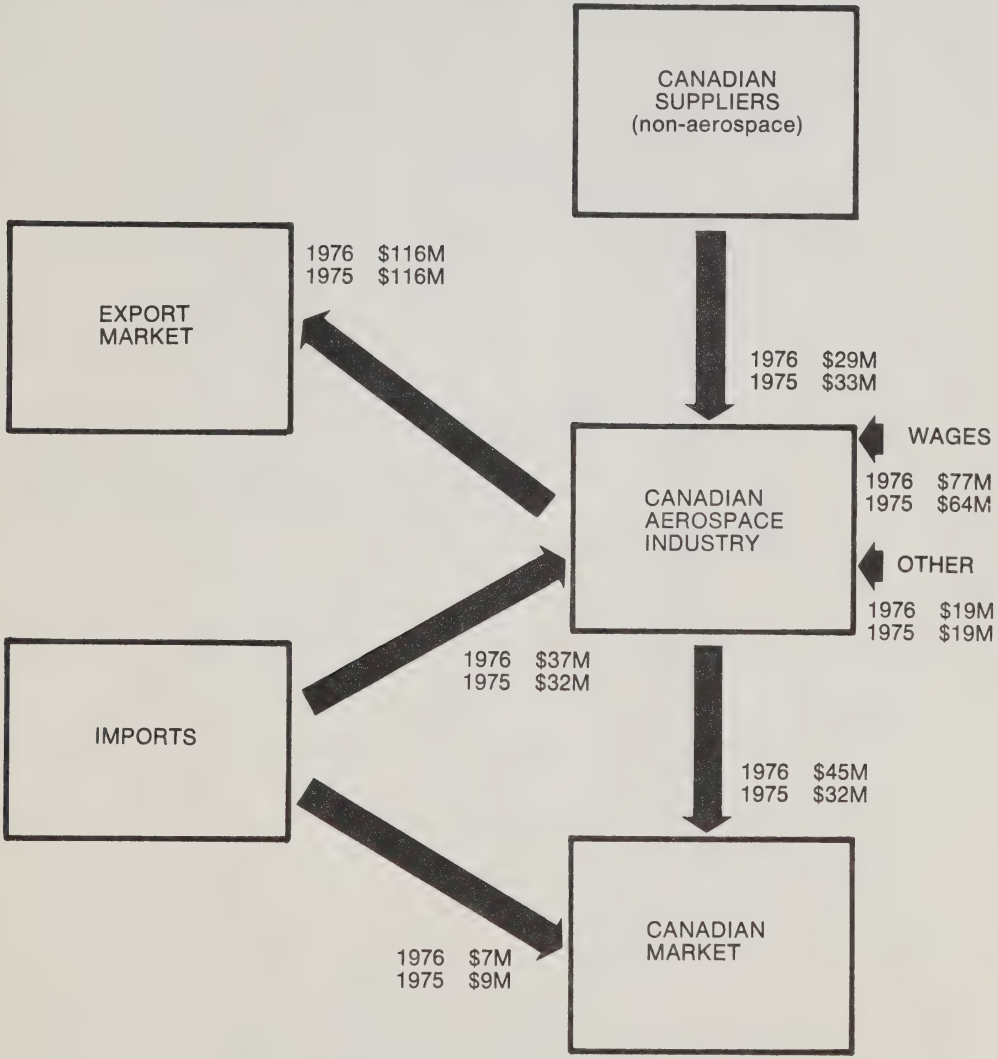
1976 — Preliminary Data (as of March 77)

INPUT-OUTPUT (REPRESENTATIVES)
CANADIAN AEROSPACE
AIRCRAFT & PARTS SUB-SECTOR



1976 — Preliminary Data (as of March 77)

INPUT-OUTPUT (REPRESENTATIVE)
CANADIAN AEROSPACE
AVIONIC & SPACE SUB SECTORS



1976 — Preliminary Data (as of March 77)

ANNEX D

Canada-United States Defence Production Sharing Procurement
January 1959 through March 1977

	1959-62	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Jan. Mar. 1977	Total
	— Millions of Dollars —																
United States Procurement in Canada																	
Prime Contracts	363.3	84.7	92.0	149.7	132.4	191.2	223.0	214.3	105.5	107.5	80.1	115.4	87.0	96.3	74.6	42.2	2159.2
Subcontracts	242.6	57.3	74.8	109.8	184.7	116.5	97.0	85.5	121.0	108.8	94.9	83.4	63.0	92.2	116.5	19.3	1667.3
	605.9	142.0	166.8	259.5	317.1	307.7	320.0	299.8	226.5	216.3	175.0	198.8	150.0	188.5	191.1	61.5	3826.5
Canadian Procurement in the United States																	
Prime Contracts	181.8	36.8	82.7	36.2	109.2	105.4	11.4cr	38.7	92.1	32.0	49.1	100.1	149.9	83.4	759.3	12.5	1857.8
Subcontracts	344.4	115.2	90.6	93.9	223.4	188.5	145.6	132.8	130.8	148.6	144.4	131.9	131.5	149.3	139.1	67.7	2377.7
	526.2	152.0	173.3	130.1	332.6	293.9	134.2	171.5	222.9	180.6	193.5	232.0	281.4	232.7	898.4	80.2	4235.5
Cross Border Balance																	
In favour of U.S.		10.0	6.5		15.5						18.5	33.2	131.4	44.2	707.3	18.7	409.0
In favour of Canada	79.7			129.4		13.8	185.8	128.3	3.6	35.7							

ANNEX E

PRODUCTIVITY ANALYSIS

Appendix I — Canadian Aerospace Industry Productivity
Appendix II — Relative Productivity and Employment
Appendix III — Average Productivity Growth Past and Future

Appendix I
Annex E

Canadian Aerospace Industry Productivity 1975
(not including avionics)
Dollar values shown in 1976 value[1]

Sub-Sector and Total Sector[3]	Hourly Paid/Total Labour		Value added per Employee		Value Added per Hourly Paid Man-Hour	
	1975 Ratio	Annual Rate of Increase[2]	1975 Ratio in 1976 Dollars	Annual Rate of Increase[2]	1975 Ratio in 1976 Dollars	Annual rate of increase[2]
Aircraft	0.56	1.8%	22,900	7.3%	19.2	5.8%
Aircraft Parts	0.69	1.4%	21,700	0.9%	15.4	1.5%
Aircraft and Aircraft Parts[4]	0.64	1.6%	22,200	3.5%	17.0	3.3%
Engines and Parts[5]	0.52	0%	17,300	3.3%	15.3	2.6%
Aerospace SIC 321[4]	0.58	0.8%	19,900	3.4%	16.2	2.9%

NOTES: 1. Supporting data deflated using Industry Selling Price Index: Manufacturing.
2. Trend rates determined via linear regression analysis over year 1970 to 1975 inclusive (1972 to 1975 for engines and parts).
3. Data source includes AIAC members only representing 92 per cent of SIC 321 Aircraft Industry.
4. Weighted averages of employment
5. Major company in Engine and Parts sub-sector experienced labour problems in 1974 and 1975.

Appendix 2
Annex E

Relative Productivity and Employment
Canadian Aerospace Industries (Less Avionics)
by Prime Activity Classification

Productivity: Value added per employee (3-year average 1973 to 1975)
ISP (Manufacturing) used as deflator

Employment: Values shown for 1975 year end

	SIC 321 Aircraft Sector		*Aircraft and Parts (Sub-Sector)*		*Engines and Parts (Sub-Sector)*	
Classification of Major Activity	*Relative Productivity*	*Employment In Sample*	*Relative Productivity*	*Employment In Sample*	*Relative Productivity*	*Employment In Sample*
Full Product Activity	0.980	12,053	1.050	6,796	0.945	5,257
Manufacturing only	1.174	3,273	1.090	2,335	1.383	938
Sub-Contract only	0.930	1,513	0.920	764	0.940	749
Repair and Overhaul only	0.851	1,630	0.836	280	0.851	1,350
Combined Activities	1.000	18,469	1.045	10,175	0.980	8,924

Appendix 3
Annex E

Canadian Aerospace Industry (Less Avionics)
Average Productivity Growth — Past and Future
(derived from data deflated via ISP (mfg))

Industry Sector	*Rate of Change of Value added per Employee*		*Rate of Change of Value Added per Man-Hour Paid*	
	Actual @ 1975 (ITC)	*Projection* @ (AIAC)	*Actual* @ 1975 (ITC)	*Projection* @ 1977 (AIAC)
Aircraft and parts	3.5%	5.8%	3.3	2.1
Engines and parts	3.3%	4.1%	2.6	4.1
Aircraft SIC 321 (weighted)	3.4%	5.0	2.9	3.1

Source of computational data:
ITC — Industry, Trade and Commerce
AIAC — Air Industries Association of Canada, Industry Consultative Sub-Committees

Note: All rates were derived via regression analysis over year-end actuals or forecasts over 4, 5 or 6 years depending upon data availability.

Annex F

Profitability

General Manufacturing — Canada

	Sales	*Equity*	*Net Profit*	*Profit as a percentage of Sales*	*Profit as a percentage of Equity*
	$ million	*$ million*	*$ million*	%	%
1968	46057	19837.7	1865.8	4.05	9.4
1969	50525	20633.8	2051.0	4.05	9.9
1970	54663.8	23141.2	1661.7	3.04	7.2
1971	59868.3	24670.9	2178.8	3.64	8.8
1972	66408.8	25800.1	2590.1	3.9	10.03
1973	78640.5	28310.9	4141.8	5.3	14.63
1974	9848.9	32400.9	5262.5	5.3	16.2

Aircraft and Parts

	Canada					*U.S.A.*	
	Sales	*Equity*	*Net Profit*	*Profit as a percentage of Sales*	*Profit as a percentage of Equity*	*Profit as a percentage of Sales*	*Profit as a percentage of Equity*
	$ million	$ million	$ million	%	%	%	%
1968	788.8	250.0	(33.4)	—	—	3.2	14.2
1969	686.0	261.8	2.0	0.3	0.7	3.0	10.6
1970	657.0	253.2	(8.3)	—	—	2.0	6.8
1971	611.7	270.9	(1.1)	—	—	1.8	5.8
1972	622.3	269.0	17.7	2.8	6.6	2.4	7.9
1973	588.1	196.9	15.2	2.6	7.7	2.9	10.3
1974	650.5	199.5	11.4	1.8	5.7	2.9	10.4

Annex G

Canadian Government Support Disbursed
to Aerospace Industry
($Thousands)

		DIP						
		R&D	*IMDE*	*Total*	*PAIT*[4]	*IRDIA*[1]	*DIR*[3]	*Total*
Aircraft and Airframe Parts Sector								
F/Y	1967/68	5,731	5,475	11,207	125	987	784	13,103
	1968/69	5,252	4,086	9,337	107	998	920	11,362
	1969/70	4,239	18,588	22,828	635	389	709	24,561
	1970/71	2,263	6,518	8,781	1,586	320	917	11,604
	1971/72	6,325	5,009	11,333	1,486	304	797	13,920
	1972/73	7,866	6,855	14,721	547	197	832	16,298
	1973/74	23,519	3,237	26,756	672	402	885	28,715
	1974/75	25,756	5,263	31,019	430	551	782	32,782
	1975/76	15,659	—	15,659	104	401	210	16,374
	1976/77	19,248	709	19,957	483	—	—	20,439
								189,158
Propulsion Engines and Parts Sectors								
F/Y	1967/68	5,573	1,916	7,489	—	14	1,331	8,834
	1968/69	8,109	1,117	9,226	—	2,227	1,216	12,669
	1969/70	7,660	1,021	8,681	186	2,222	1,271	12,360
	1970/71	8,044	449	8,493	92	455	1,813	10,853
	1971/72	6,875	1,327	8,202	2	122	1,941	10,167
	1972/73	11,089	1,390	12,479	—	379	1,866	14,724
	1973/74	11,237	1,349	12,586	—	439	2,211	15,236
	1974/75	4,395	760	5,155	—	379	489	5,023
	1975/76	9,634	2,527	12,161	—	158	200	12,519
	1976/77	9,278	652	9,930	—	—	—	9,930
								112,315
Avionics Sector								
F/Y	1967/68	5,628	—	5,628	571	1,194	461	7,854
	1968/69	4,789	—	4,789	775	1,046	535	7,145
	1969/70	6,322	—	6,322	262	488	477	7,549
	1970/71	7,521	—	7,621	699	734	323	9,277
	1971/72	12,572	1,127	13,700	1,352	593	406	16,051
	1972/73	6,475	859	7,334	1,426	253	353	9,366
	1973/74	6,296	895	7,191	1,401	207	490	9,289
	1974/75	3,583	385	3,968	—	442	358	4,768
	1975/76	2,630	4	2,634	—	1,153[5]	299	3,816
								75,115

[1] *1975 preliminary*
[3] *Grants terminated March 1976*
[4] *1967-1973 includes non-aerospace products*
[5] *Program terminated Dec. 1975*

Annex H

Total Intramural R&D Expenditures on Aircraft and Parts
for Selected OECD Countries, by Source of Funds, 1973

*Country**	*Own Funds*	*Government*	*Other Enterprises*	*From Abroad*	*Total*
Canada ($ mil.)**	17.2	29.8	0.4	6.5	53.9
France (Fr. mil.)	427.6	1,641.4	125.5	96.0	2,290.5
West Germany (D.M. mil.)	143.0	825.0	—	116.0	1,084.0
Britain (£. mil.)	11.5	176.1	—	20.5	208.1
U.S. ($ mil.)	1,090.0	3,961.0	—	—	5,051.0

**In other countries either data is not available or the aircraft industry contributes less than 0.1 per cent of gross expenditure on R&D. Sweden — not separately available, but included in "other transport" with motor vehicles.*

***These figures may not correspond exactly to Statistics Canada data as Statistics Canada figures are constantly revised.*

Source: OECD, International Statistical Year 1973, Vol. 1 (January 1977)

Annex J

Distribution of Employment Type
Air Industries Association of Canada

*Employment Type**	*(Year)*	*Airframe and Parts*		*Engine and Parts*		*Avionics*		*Total*	
Engineering and Scientific	(1975)	1,193		644		602		2,439	
	(1976)	1,146		481		1,074		2,701	
	(1977)	1,396	10%	561	6%	1,054	22%	3,011	11%
Production	(1975)	6,897		4,076		2,389		13,362	
	(1976)	6,595		3,657		2,403		12,655	
	(1977)	9,063	65%	4,027	41%	2,450	50%	15,540	54%
Other	(1975)	3,692		5,477		1,928		11,097	
	(1976)	3,121		5,346		1,345		9,812	
	(1977)	3,489	25%	5,253	53%	1,349	28%	10,091	35%
Totals	(1975)	11,782		10,197		4,919		26,898	
	(1976)	10,862		9,484		4,822		25,168	
	(1977)	13,948	100%	9,841	100%	4,853	100%	28,642	100%

**Employment Type:*

— Engineering and scientific includes;
- *Professional engineers*
- *technologists*
- *scientists*
- *draughtsmen*

— Production;
- *machine operators*
- *fitters*
- *welders*
- *painters*
- *quality control inspectors*

— Others;
- *management*
- *marketing*
- *purchasing*
- *finance*
- *personnel services*
- *shipping, receiving*
- *production control*
- *stores control*

Source: Air Industries Association of Canada

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